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CAZEAUX AND TARNIER.

EIGHTH AMERICAN EDITION.

WITH APPENDIX BY PAUL F. MUNDÉ, M.D.,
AND NEW ILLUSTRATIONS.

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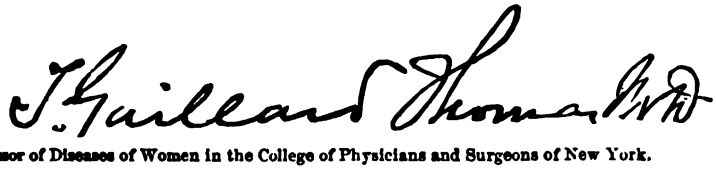

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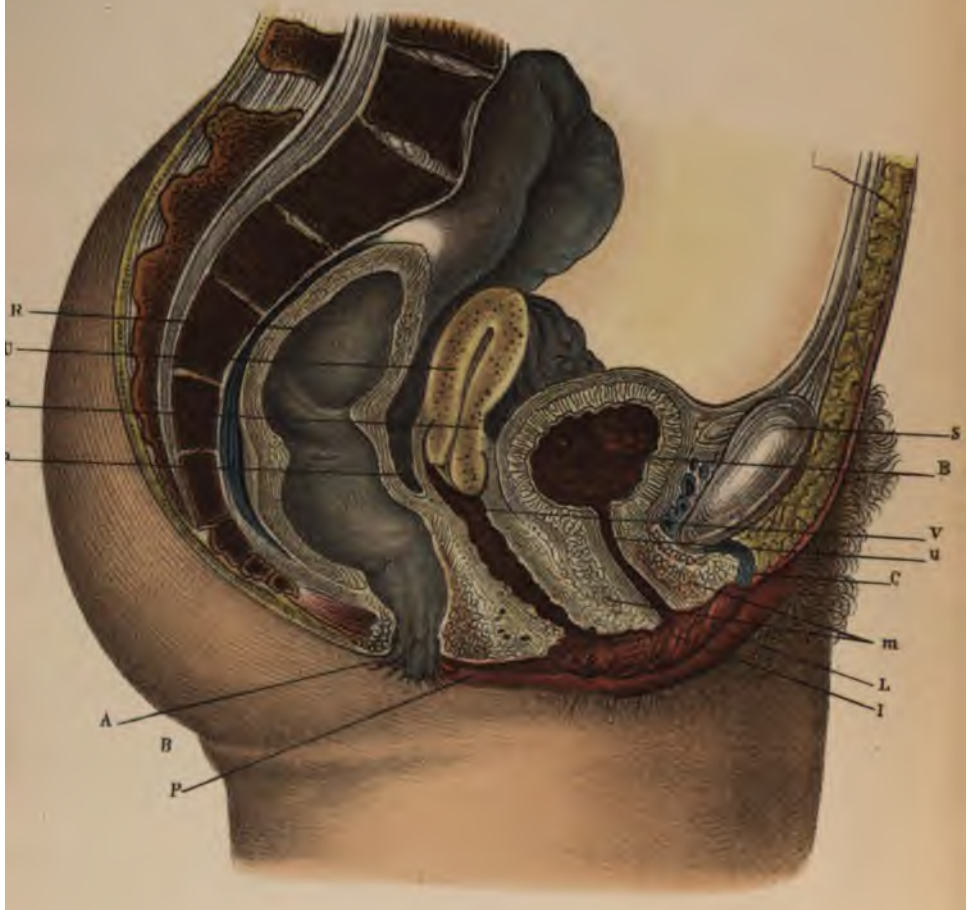
Plate I.



For Explanation see Page 92.

CAZEAUX AND TARNIER.

THE

THEORY AND PRACTICE

OF

OBSTETRICS

INCLUDING DISEASES OF PREGNANCY AND PARTURITION, OBSTETRICAL OPERATIONS, ETC.

BY P. CAZEAUX,

MEMBER OF THE IMPERIAL ACADEMY OF MEDICINE, ADJUNCT PROFESSOR IN THE FACULTY OF MEDICINE, PARIS, ETC

REMODELED AND REARRANGED, WITH ADDITIONS AND REVISIONS,

BY S. TARNIER,

PROFESSOR OF OBSTETRICS AND DISEASES OF WOMEN AND CHILDREN IN THE FACULTY OF MEDICINE, OF PARIS.

THE EIGHTH AMERICAN EDITION.

EDITED AND REVISED BY ROBERT J. HESS, M. D.,

PHYSICIAN TO THE NORTHERN DISPENSARY, PHILADELPHIA.

WITH AN APPENDIX,

BY PAUL F. MUNDÉ, M. D.,

PROFESSOR OF GYNECOLOGY AT THE NEW YORK POLYCLINIC AND AT DARTMOUTH COLLEGE; VICE-PRESIDEN AMERICAN GYNECOLOGICAL SOCIETY, ETC.

WITH CHROMO-LITHOGRAPHS, LITHOGRAPHS AND OTHER FULL-PAGE PLATES, AND ONE HUNDRED AND SEVENTY-FIVE WOOD ENGRAVINGS.

PHILADELPHIA:

P. BLAKISTON, SON & CO.,

1012 WALNUT STREET.

1889.

PREFACE TO APPENDIX.

At the request of the Publishers I have prepared this appendix to Cazeaux and Tarnier's Theory and Practice of Obstetrics. It is designed to include a number of subjects which have been omitted or but lightly touched upon in the work itself, or which appear especially interesting and useful to the profession at this time.

In doing this, while it has been my object to bring each topic as near as possible down to date, I have not intended to treat of each exhaustively, but rather to present them in a practical manner, taking pains to discuss each question more particularly from the point of view of most interest to the general practitioner.

While the general tenor of recent professional opinion has been followed in the several articles, the expressed views of the most eminent obstetricians have received full attention and are largely quoted, proper credit being given by foot-notes wherever the references appear.

I trust that this addition to Cazeaux and Tarnier will add to its value and usefulness, and will commend it to the profession as a most exhaustive and systematic treatise on obstetrics.

The chapters on Hygiene and Dietetics, on Anæsthetics and Narcotics, on Antisepsis, and on Obstetric and Gynecic Jurisprudence, have been prepared under my supervision, by my assistant, Dr. Brooks Hughes Wells, to whom I am also indebted for much valuable aid in the collection of material, proof-reading and correspondence.

20 West 45th St., New York. PAUL F. MUNDÉ.

APRIL, 1886.

CONTENTS OF APPENDIX.

I.

THE HYGIENE AND THERAPEUTICS OF PREGNANCY, LABOR, AND THE PUERPERAL STATE.

THE object of this paper being only to discuss those parts of the subject which are omitted or only lightly touched upon in the body of the work, the therapeutics of the so-called "diseases of pregnancy" will not be treated of, except to give to the reader some hygienic or therapeutic measures which my experience has led me to consider reliable.

Though a strict line of distinction cannot be drawn between them, we will endeavor, first, to consider the general dietetic and hygienic measures most useful and necessary, from the time of conception to the completion of post-puerperal involution, and then will speak of the therapeutic measures and agents of most importance in the treatment of certain pathological conditions which may arise during this period.

HYGIENE: *of Pregnancy.*

In the gravid state, from the moment of conception to the time of birth, the normal, or rather the physiological, so frequently approaches or even stealthily oversteps the boundary separating it from actual disease that the conservation of its proper hygiene, and the intelligent treatment of the pathological conditions which may arise call for a degree of diagnostic acumen, and a measure of quickness, accuracy and self-reliance on the part of the physician which is not always or easily attained.

Your patient should be made to understand and feel that both her own welfare and that of her unborn child may greatly depend on the proper use by her of certain hygienic and dietetic measures.

Cleanliness may be said to be the first of these, and cleanliness in its very widest sense; the *primæ viæ*, the kidneys, the lungs, the skin, should each be given every facility possible that can aid in the task of removing the waste and effete matter from the system. The almost ever present tendency to constipation should be combated and counteracted, if possible, by the regulation of the habits and diet. This latter should be plain and nutritious, and should consist partly of fruits and coarse bread made from unbolted flour. This not being sufficient we should use mild laxatives, preferably some of the natural or artificial saline waters, the compound liquorice powder or other simple aperient. The physician should not place too great reliance on the statements or opinion of the patient in regard to the condition of the bowels, as deception may be intentional, or, as some women consider that a stool once a week is all sufficient, may proceed from ignorance, but should judge for himself by the careful noting of the subjective symptoms; the coated tongue, the foul breath, the dull and discolored con-

junctiva, the frontal headache, the capricious appetite, the disordered digestion, all uniting in telling a story no one can mistake.

The kidneys, the most important emunctory organs, taxed at this time to their utmost by the altered vascular tension and changed quality of the maternal blood, as well as by the large amount of excrementitious material which it contains, should not have their burden increased by the neglect to keep the other eliminative organs of the body honestly at work. Gluttony should be avoided as much as its opposite. The body should not be exposed to cold or wet, for this, by causing a renal congestion, is especially apt at this time to be the feather which turns the scale toward disease, always serious and often persistent. The urine should be tested for the presence of albumin every second week during the latter months, that the consequences of its presence do not confront us unawares.

Cleanliness of the skin by frequent tepid spongings or baths enables its glands to work freely, and thus to relieve the kidneys from a part of the strain imposed upon them.

Plenty of fresh air and sunlight, by enabling the oxidation processes to go on more rapidly and perfectly, are of the first importance; the patient's rooms should be as perfectly ventilated, both by day and by night, and as free from any source of impure emanations, as is possible; she should not visit a crowded lecture hall, or theatre, or church, or any place where the air is impure, not only from the presence of an abnormally large percentage of carbon dioxide, but also from the nameless exhalations from the breath and skin, which we recognize as *closeness* on coming from a pure air into a crowded room.

Exercise, avoiding that which is violent or excessive, should be insisted upon, the usual household duties should not be relinquished, and the woman should be required, in addition, to be in the open air a certain part of each day. In the latter months, should a diffidence, born of her condition, keep her from going out in the daytime, send her with her husband, for a walk, in the evening. That moderate exercise exerts a beneficent influence on the course and termination of pregnancy, is plainly seen in the Maternities, where a part of the "waiting women" remain idle in the wards, while the remainder are employed as help, and have light work of various kinds to perform, the latter almost invariably remaining in a much more healthy condition during their pregnancy, and enjoying a shorter and more easy labor, their children also seeming to possess more vitality.

Excitement of all kinds and anxiety should be prevented, as far as is possible; sexual intercourse should be prohibited, as having, by increasing the congestion of the genital tract, a possible tendency to produce abortion, especially at what would have been the periods of the menstrual flow; sufficient sleep should be procured; the clothing should be warm and comfortable and loose-fitting, and should be enlarged as the breasts and abdomen increase in size, so that there be no constriction or pressure of these parts. Where the abdomen is pendulous or flabby, the patient may wear an abdominal

supporter with advantage. During the first few months of pregnancy the uterus should be examined, especially where retroversion or prolapsus has existed before, to see that the uterine axis is normal, and in the latter months, to make sure that the presentation is not faulty.

Toward the latter part of pregnancy the nipples should be examined, with reference to the cure of possible fissures or tenderness, or the remedying of a depressed condition, much trouble and suffering being often saved by a few simple precautions taken at this time. If the nipples be flat or depressed, their condition may often be much improved by lifting them up by the fingers, or by inverting the bowl of a clay pipe over them and drawing them out gently, daily, by suction, the dress being worn so that no pressure comes over them. If there be even a suspicion of tenderness or fissure, some astringent lotion, as brandy and water, or Goulard's extract, should be applied every other day for a month before the expected confinement.

Of Labor.—When labor begins, the fears of the patient, especially if a primipara, should be allayed; she should, in general, be told that everything is all right, though any expected complication should be stated to the friends; no definite prognosis as to the result or time of termination of the labor should be given, a delphic ambiguity in our answers to these questions being most desirable. The patient should have any light food she may desire; the bowels should be thoroughly cleared out by an enema of oil, or an ounce or so of glycerite of ox-gall and warm soapsuds; the latter combination being a most efficient measure. The bladder should be regularly emptied at short intervals; the hair, if long, should be braided, and a loose wrapper put on, so that the patient may be in readiness for the incidents attending the advent of the second stage. We have supposed that before this the accoucheur has informed himself, by abdominal palpation (see Article III), of the position and presentation of the fœtus, and by digital examination, per vaginam, of the condition of the maternal soft parts and the probable absence of any deformity or obstruction in the pelvic walls. Other necessary attentions to the mother and child during and after labor, have been exhaustively treated of in the body of the work (page 388 *et seq.*), to which we refer the reader.

Placental Expression.—I must take exception to the method advocated, of delivering the placenta by forcible traction on the cord (page 381 *et seq.*), an antiquated procedure, which is now only employed by ignorant midwives or by irresponsible persons falsely claiming to be physicians.

The method which I employ in my practice, and which I have used for years with the best results, is as follows: When the child is born, a drachm of fluid extract of ergot is given, and gentle friction made by the hand on the fundus until the cord ceases to pulsate, when the cord is doubly ligated and cut, and the child given to the nurse; the hand is then (its place having been supplied by that of the nurse during this short interval) replaced over the uterus, and gentle friction continued until the uterus contracts uniformly;

as soon as this occurs, the uterine sphere is grasped by the whole left hand, or, if necessary, by both hands, and gently compressed toward the axis of the brim; if the placenta is not then felt to escape, as shown in the immediate decrease in the size of the uterus, the friction is recommenced, and expression again tried, until the afterbirth is expelled. Unless it voluntarily emerges between the labia, I have found it much less painful to the patient and fatiguing to the physician, to draw *gently* on the cord as soon as the palpating and expressing hand shows that the placenta has escaped from the cavity of the uterus, and thus guide it over the perineum, where it is received by the right hand and gently withdrawn with a twisting motion, so as to make a cord of the membranes, rather than attempt to force it out of the vagina by supra-pubic pressure.

As soon as the placenta has been removed, gentle, steady friction is kept up over the fundus, with occasional expression of coagula, until permanent contraction ensues, which may occupy half an hour, or, in doubtful cases, a longer period. Then, if necessary, a compress is laid over the fundus and a binder applied, this latter article being used more as a comfort and support to the woman than because it is absolutely necessary for her subsequent recovery.

In some cases prolonged gentle friction of the uterus is indispensable to secure the detachment of the placenta, before which detachment even the most forcible expressive power will be in vain. It can be readily ascertained by the palpating hand—and often the eye can see—whether or not the placenta is detached, one or the other uterine horn projecting above its fellow—evidently, the remainder of the uterus contracting, while the placental site remains passive. As soon as the latter also contracts, the uterus will assume a smooth, spherical contour, and then expression will prove effective. This friction, with occasional trials of expression, may last fifteen minutes or more, though I have seldom found it to exceed the quarter-hour.

In case the gentle traction upon the cord should fail to extract the placenta from the vagina, one or two fingers may be passed into the rectum, and the placenta thus dislodged.

The advantages of placental expression, as above described, are obvious, and may be briefly enumerated as follows: The avoidance of the introduction of the hand into the vagina and uterus and of forcible traction on the cord, and, therefore, of possible septic infection, tearing out of the cord and sudden inversion; further, the prevention of hemorrhage and the speedy expulsion of the placenta by propulsion—the natural mechanism.

Disadvantages there are none, except those mentioned below, and injuries to the uterus from careful, steady, not too violent, expression have not been known to occur. It may be well to sound one note of warning, and that is, not to make unequal pressure on the uterus, particularly on the relaxed placental site, which, if the remainder of the organ chance to be flabby, might possibly produce partial or complete inversion.

The same obstacles to the expression of the fœtus—hyperæsthesia, inflam-

matory affections or obesity of the abdominal walls—will naturally, also, interfere with placental expression to a greater or less extent. The chief obstacle to expression of the placenta is its pathological adherence, which, since the adoption of expression, has become very much less frequent than formerly. Another obstacle, not uncommonly taken for actual adherence, is a spasmodic contraction at the internal os or at either horn of the uterus—the placenta lying loose above the constriction—which cannot be overcome by expression, it being generally necessary to dilate the constriction and remove the placenta manually. Positive adhesions must be severed by the hand in utero; expression will not succeed. The expression of the placenta, in a case of greatly premature delivery, may occasionally fail, either because the organ is very small and lax or the child is dead.

A precaution which should never be omitted is, to inspect the placenta immediately after its delivery, particularly the maternal surface. Should any cotyledons be found missing, search should be made for the absent portions by introducing the hand into the uterus, where they will be found, either adherent or loose.

Immediately after the removal of the placenta, the uterus will be felt by the palpating hand as a firm, hard ball, of the size of a child's head, some three or four inches above the pubes. Frequently one circumscribed portion or other of the fundus, corresponding to the prominence previously felt, will now be found depressed and soft, showing a slightly inverted site of the placenta. This, which Fritsch calls a "normal physiological paralysis of the placental site," soon disappears with the uniform contraction of the uterus induced by gentle friction, which should be continued for from a quarter to half an hour after delivery, until the danger from hemorrhage is past. Not uncommonly relaxation of the uterus takes place several hours after labor, and oozing of blood occurs into the uterine cavity, distending it frequently to double its normal size. I have repeatedly expressed clots of the size of a fist from the uterus three or four hours after labor. But this was at a time when I was not in the habit of giving ergot simultaneously with the birth of the head, as I now do. The advisability, therefore, of palpating the abdomen of every puerpera, at intervals within twelve hours after delivery, is apparent. I always instruct the nurse to watch the size and tension of the uterus, and show her how high the fundus should normally stand; in the absence of a nurse, the patient herself may be taught to feel and watch over her uterus.

Of the Puerperal State.[1]—For the first few hours after labor, the woman should have only fluid nourishment, such as milk or broth; but after this time she may have almost anything she desires in the way of food, except articles of known difficult digestion, her diet being made as nutritious as possible—chicken, beef, eggs and milk being its staple articles. At the same time, care should be taken not to disorder the digestion by over feeding.

[1] See page 421 *et seq.*

The bowels may be left alone until the third day, when, if they have not moved, a cathartic should be given; after this, they should be kept regular. It is not necessary to give the time-worn, nauseous dose of castor oil; other remedies more pleasant are equally efficient. Constipation often produces a rise of temperature and a feeling of general wretchedness, which may easily be mistaken for an indication of more serious trouble until a cathartic removes the symptoms, clearing the intestinal canal and the diagnosis at the same time.

The urine should not be drawn except where, after trial, the woman is found unable to pass it herself, this trial being repeated each time before the instrument is used, or where a perineal laceration has been closed, in which latter case the catheter may be passed for a couple of days. The bladder should be frequently evacuated during the first twelve hours after labor, as its even moderate distention at this time markedly increases the tendency to uterine relaxation and consequent oozing of blood or accumulation of clots in its cavity.

I object to the routine use of the catheter after labor, advocated by many authorities, for two reasons: first, that it is often unnecessary, and second, on account of the danger of causing cystitis, of which I have seen some instances, by carrying irritating or infectious material into the bladder.

You may say that this can be avoided by perfect cleanliness, and so it can be, but it is difficult, and often impossible, to impress on the mind of the nurse or attendant what this cleanliness is, or the necessity for its accomplishment, and the physician himself can hardly be present every time the patient wishes the urine drawn, and see that the genitals are carefully washed and proper precautions observed in the passage of the catheter, this being done by inspection, in order to avoid introduction of lochia into the bladder, and not by touch, as formerly taught.

A binder, applied with moderate firmness, and reaching from about the tenth rib to below the trochanters, is a source of much comfort to the patient, and is of benefit by supporting the relaxed abdominal walls, and by maintaining a certain increased amount of intra-abdominal pressure assisting the contraction of the heavy uterus. The binder usually should not be worn more than eight or nine days.

After-pains are best prevented by keeping the uterus well contracted by the use of ergot, and most surely relieved by morphia and camphor, or stupes of chloroform liniment. Ergot also is valuable in hastening involution (see below).

The proper management of the breasts at the onset of lactation is of the greatest importance. I do not believe in the common occurrence of the so-called "milk-fever," which many regard as a natural or essential condition when the secretion of milk begins, for where antisepsis (V) in its details is successfully carried out, and the breasts are not allowed to become over-distended and painful, the temperature during the whole lying-in period should

not go above 99°. The question which now demands our attention is, what is the proper management of the breasts?

About one year ago Dr. Phil. A. Harris, of Paterson, N. J., in a paper on "The Treatment of Mastitis by Bandaging and Rest,"[1] directed the attention of the profession in general to the advantage of systematic pressure in the treatment of threatened or existing mammary abscess or inflammation, and conclusively showed the good results which could be obtained by this treatment.

At this time the same principle of support and pressure was undergoing evolution at the New York Maternity Hospital, where for many years support had been given to pendulous breasts by a strip of muslin pinned around the chest. From this was gradually developed the treatment now used there, which is as follows: After labor, if the patient's mammæ are at all heavy or pendulous, a *breast binder* is applied, by which the breasts are lifted upward and toward the middle line, only slight tension of the binder being required for this purpose. When the secretion of milk begins, if the breasts become very full and tender, the pressure is increased, and, if added heat and tenderness tell of probable beginning inflammatory trouble, the binder is applied as tightly as it can be drawn, and is not removed except when it becomes soiled, until all is right. Should the nipples become so sore that it is not considered proper to allow the child to nurse, they are touched with the silver stick, dusted with tannic acid and the binder is put on tightly and left in place until the nipples are healed. If only one nipple is sore, it is found most convenient to bind up both breasts, leaving a small hole or flap which can be pinned up after nursing, opposite the sound nipple. When the child is still-born, or it is wished to prevent or diminish the secretion of milk for any cause, the binder is at once applied *tightly*, a piece of lint soaked in a solution of atropia sulphate in glycerine (gr. ss to ℥j) having first been placed over the breast, and allowed to remain as long as may be necessary. The atropia solution may sometimes cause slight dryness of the fauces and dilatation of the pupil, but is a very neat, elegant and efficient preparation. *No rubbing or manipulation* of the breast is allowed under *any* circumstances, the milk when in excess flowing away spontaneously under the pressure of the bandage.

This compression of the mammæ, under the circumstances just mentioned, invariably relieves the symptoms, so that an inflamed or suppurating breast is rarely seen where this method of treatment is properly carried out.

The binder, as now used, was devised by Miss Marion Murphy, the supervising nurse of the Maternity. A strip of cheap, unbleached muslin (cheap, loosely woven cloth fits the figure better than that which is firmer), a yard long and eighteen inches wide, is folded once, so as to form a square, and a piece cut from the folded edge (as in Fig. 160, *a*), beginning about five inches from the top and extending two inches into the cloth; this edge is then

[1] *Am. Jour. Obst.*, Vol. xviii, 1885, p. 1.

folded over in the same direction again about seven inches, and a second piece cut from the new fold (Fig. 160, *b*) as at first, but beginning nine inches from the top and extending a trifle over two inches into the cloth, so that when unfolded it would be represented by Fig. 161. When this bandage is applied the breasts are at first lifted upward and inward, toward the median line, a little cotton or oakum being placed between them, and, in some cases, around them, if the bandage is to be applied tightly, none being required if it is merely put on for support; the edges of the cloth are then turned in

FIG. 160.

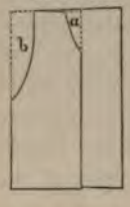


FIG. 161.

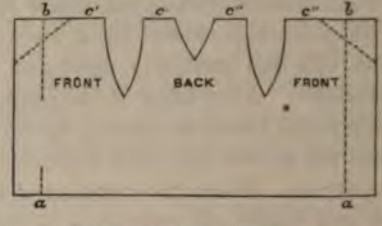


FIG. 162.

and pinned in the median line (Fig. 162 *a b*), always from below upward, the parts over the shoulders (Fig. 162, *c' c''*) being pinned last. A little practice is required to enable one to apply this binder effectively and neatly. Its advantages are, that while just as efficient as the roller-bandage, even when the latter is most skillfully applied, it can be put on more easily and quickly, the patient is not disturbed, not having to sit up, it never becomes displaced, is neater and more comfortable.

THERAPEUTICS.

Ergot.—In regard to the dangers following the use of this drug as an oxytocic in conditions of uterine inertia occurring before the birth of the child, Barnes, in his recent admirable work, expresses my opinion most graphically when he says: "Before whipping up the uterus to increased exertion, we must be satisfied that there is no obstacle in front so great that reasonable increase in driving force will not overcome without injury. We must be sure that there is no marked rigidity along the parturient tract, no distortion or contraction of the pelvis, no disproportion or malposition of the fœtus, or other obstructive complication. This postulate is not always easy to obtain; and error or miscalculation may entail serious, even fatal consequences. This is one objection to ergot. There are many others. The case, once entrusted to ergot, is likely to be beyond our control. We have evoked a brutal power like that given to Frankenstein. Ergotism, like strychnism, will run its course. If it acts too long or too violently, you cannot help it. You may try epichontocics, but these may fail. The ergotic contraction of the uterus, when characteristically developed, resembles tetanus. Then woe to the mother if any obstacle should delay the passage of the child, and woe to the child if it be not quickly born. The ergotic contraction does not observe the physiological character of alternating diastole, systole and

repose, conditions necessary to the orderly circulation of the blood through the uterus, placenta, and fœtus."

Barnes, also, considers it an imperative rule not to give ergot during the placental stage, saying that it is likely to prevent the very object in view, by exciting irregular or tetanoid contractions, which lock up the placenta and render attempts at its extraction abortive and dangerous. Here, however, I cannot agree with him, as my routine practice is always to give ergot immediately after the birth of the child—the placenta being expressed as described above, and in an extensive experience I have yet to note any ill result from its use in this manner, though much that is good; not so much in the prevention of immediate hemorrhage as in the insuring of permanent and thorough contraction of the uterus.

I am in the habit, in cases where I fear subinvolution, of giving a pill containing one grain each of ext. ergot and quinine and one-fourth grain of ext. nuc. vom. three to four times daily during the first two weeks, or even longer, if the presence of bloody oozing shows that involution is not taking place properly.

Iron and strychnia may often be advantageously combined with ergot where the patient is weak and anæmic. The danger which some mention, of causing super-involution, I have never seen, and I do not think that it will ever occur if attention is given to the degree of involution reached, and the ergot stopped when the uterus is reduced to nearly its normal size.

In post-partum hemorrhage, where the stimulus to contraction is wanted at once, ergot should always be administered hypodermically, as we cannot afford to wait fifteen to twenty minutes for its effect when given by mouth. A good plan is to inject five or ten grains of Squibb's solid extract, dissolved in twenty minims of water, when the hemorrhage is threatened. This acts promptly and certainly. Pain at the point of injection is apt to be complained of subsequently, which is easily relieved, if necessary, by fomentations of lot. plumb. et opii, but seldom anything more serious—abscess rarely being developed if the injection was made deep into the subcutaneous cellular tissue, or even into the muscles.

Chloral.—In the therapeutics of the first stage of labor a most useful agent, one which will relieve false—though stimulating true—pains, which will quiet nervous or hysterical irritability, will procure refreshing sleep, obtund the sensibility to pain, assist the dilatation of the os when the cervix refuses to yield to the force of normal pains, and will accomplish these ends with no harm and with but insignificant danger to the patient, is *chloral*, properly administered. Also in the second stage—when we require that which, while it produces a partial anæsthesia, does not lessen the force of the uterine contractions, and does not cause in the third stage, or after, any increased liability to uterine inertia and hemorrhage—chloral is efficient and safe. In the vomiting of early pregnancy we have found it efficient in the drop doses noted above, and in the medical treatment of eclampsia it is, when combined with other agents, a most valuable accessory.

Altogether, we see that we can, by its use, fulfill a wide measure of the therapeutic indications of pregnancy and labor.

While chloral can be administered to such an extent as to produce surgical anæsthesia—so that even amputations and the Cæsarean section have been done with the patient under its influence—such procedures are dangerous, and may lead even to fatal results—death being caused by the direct paralysant action of the drug upon the heart, its movements ceasing in diastole. While in obstetric practice no death has occurred that can be directly attributed to the action of chloral, still, as fatal cases of poisoning have been reported from its use in other conditions, it is well to be acquainted with the symptoms which result from an overdose and the best means of combating them. Death has resulted in an adult from a dose of twenty grains, and, on the other hand, a patient has recovered after taking an ounce. These, however, are the extremes. "From other cases, it appears tolerably plain that most people would recover, especially with appropriate treatment, from a single dose under 8 grms. (gr. 120), but anything above that quantity taken at one time would be very dangerous, and doses of 10 grms. (150 grs.), and above, almost always fatal. If, however, 8 grms. were taken in divided doses during the twenty-four hours, it could be done with safety."[1]

With safe doses, the hypnotic state is not so intense that sleep cannot be easily warded off; in dangerous doses, the narcosis is uncontrollable, the appearance of the subject being strikingly like that observed in alcoholic intoxication.

Personally, I have only, out of a large number of cases, seen one where the symptoms were at all alarming. The patient had taken sixty grains and appeared decidedly drunk, not being able to walk and being almost completely anæsthetic. She was given five grains of caffeine citrate and, the heart's action being good, was allowed to sleep. In three hours the effects had entirely passed away. Should we be so unfortunate as to produce poisonous effects, we should at once employ emetics, and, these failing, the stomach tube. Strong, hot coffee should be given by the stomach or in an enema; the body should be kept warm; the patient should be roused by shouting, shaking, striking with a wet towel, etc., and, in more serious cases, small hypodermics of strychnine sulphate or nitrate should be given and repeated, and artificial respiration practiced, if necessary. Amyl nitrite has been recommended, and small doses of any of the nitrates might be given hypodermically.

In the many cases where I have used this drug, I have almost invariably succeeded in attaining the end I wished, and have seldom found it necessary to give more than forty-five or sixty grains. I have seen cases where fifteen grains was all that was needed, and once have given one hundred and five grains before the patient became quiet. In some instances, where the patient is of an excitable disposition, a noisy, semi-delirious state is caused by moderate doses; this condition is relieved by increasing the dose.

[1] Blyth: "Poisons, their Effects and Detection." Wm. Wood & Co., N. Y., 1885, p. 138.

I have many times introduced my hand into the uterus to remove membranes or fragments of placenta after the patient had taken forty-five grains in divided doses, and the act has scarcely been noticed by the woman. The agony of the expulsive pains is so very much lessened by the drug, used as described below, that it is seldom necessary to give an additional anæsthetic, except for serious operations, or where we wish to have complete relaxation of the uterine muscle. In this case, ether would be preferable to chloroform, because of its stimulating effect on the heart. In a minority of cases, chloral seems to diminish somewhat the force of the uterine contractions; in more, it has no appreciable effect on them; while in most instances it seems to make them stronger, and certainly increases their efficacy.

I consider the best mode of its exhibition to be by mouth, giving a fifteen or twenty-grain dose once, for the removal of pseudo-pains; fifteen grains, repeated every hour, or long as may be necessary to lessen nervous irritability and to relieve the nagging pains of the first stage; the same dose, at half-hour or twenty-minute intervals, in conjunction with repeated hot douching, to lessen rigidity of the cervix—these measures almost never failing to cause the cervix to become very soon soft and distensible. Just before the beginning of the second stage, especially in primiparæ, it is advisable to give, unless there be contra-indications, an additional dose of fifteen grains, or even more, so as to produce a decided degree of partial anæsthesia during the expulsive effort.

This method of exhibiting the drug may sometimes produce nausea, and when this is the case, or when we suspect an irritable condition of the stomach, it may advantageously be given per rectum, in the form of an enema, in the same doses as by mouth. The enema may be a simple aqueous solution, or, better, the drug may be beaten up with gruel, or with a raw egg and a little milk, and whisky or brandy, if indicated; the whole to measure about two ounces. Kane[1] recommends the addition of ten minims each of tinct. of opium, digitalis, and belladonna to each thirty grains of chloral. I have found this combination to be excellent in cases where I have used it. The addition of from one-eighth to one-third of a grain of sulphate of morphia increases markedly, in nearly all cases, the hypnotic and anæsthetic effects of the chloral.

Chloral has also been found a valuable agent in the remedial treatment of puerperal eclampsia, especially when combined with large doses of morphia; it should be given in one dose of twenty grains, and should not be repeated, as it is here apt to produce dangerous symptoms. The morphia should be given in large doses (½–¾–1 gr.), and hypodermically,[2] and this apparently hazardous treatment seems not only safe but efficient.

In threatened abortion, chloral often acts in a most happy manner. It is best used combined with rest and morphia, and may be given in ten or fifteen-grain doses every hour, as may be necessary and safe.

[1] *Am. Jour. of Obst.* 1881. Vol. XIV, p. 280.

[2] C. C. P. Clark, of Oswego, N. Y., may be said to be the pioneer in this method of giving morphia in eclampsia.

A saturated solution, given in one-drop doses every five minutes, so long as may be necessary, up to fifteen doses, is exceedingly efficacious in relieving the nausea and vomiting of early pregnancy. One-drop doses of comp. tinct. of iodine will also be found useful in this condition.

It must be understood that chloral, in the doses recommended above, should only be given when the patient is under the immediate supervision of the physician.

Morphia.—Morphia as an anodyne, hypnotic, and antiphlogistic agent—this latter especially in the inflammations of serous cavities, stands unexcelled. It is not my intention here to discuss the minutiæ of its action, or the *pros* and *cons* concerning its use, but to state briefly under what circumstances and how we, as obstetricians, should use the drug.

In threatened abortion, morphia in full doses, combined with perfect rest in the recumbent position, and cold applications to the hypogastrium, is the most powerful agent we possess to lessen the irritability and congestion of the uterus and prevent the impending dislodgment of the ovum.

It is also a reliable means of checking the pseudo-pains, which so frequently come on just before term, though I prefer chloral, oftentimes combined with an agent to clear out the lower bowel, for this purpose.

When the os is rigid, and dilatation slow and painful, so that the patient becomes exhausted and the uterus unable longer to contract, this drug is again of great value, procuring for the sufferer refreshing sleep, during which nature can remarshal her forces and gain strength to carry the labor to a successful termination.

It is, however, in pelvic inflammation, especially peritonitis, that morphia is most indispensable; here, with the first appearance of the symptoms, it should be given in amount sufficient to relieve pain, and this, with appropriate local treatment, may be all that is necessary; if, however, the disease should become general, it should be given boldly, the dose being measured only by the effect—enough being used to relieve pain, to diminish peristalsis, and to keep the patient in a somnolent condition—and continued until the danger is passed.

This method of controlling general peritoneal inflammations, by the exhibition of heroic doses of morphia, now admitted to be one of our best methods for its treatment, was first instituted by Dr. Alonzo Clark, who achieved most gratifying results from its use.

Quinine.—In addition to its systemic tonic effects, its specific action in malarial disease and its power of reducing temperature, we have in quinine an agent which, if not always certain in its oxytocic effects, is safe, and, in the majority of cases, effective in its action.

In my experience it has nearly always markedly stimulated flagging pains, and, in any case, has increased the energy of uterine contractions when once labor has begun. As an abortifacient, I do not think it has any marked

power, except when given in overwhelming doses, and where abortion is threatened as a consequence of malarial toxæmia it has been proved to be one of the most effective means for diminishing the uterine irritability.[1] I have always found that I produced as marked oxytocic effects from doses of from ten to fifteen grains by mouth, or fifteen or twenty by rectum, as from the exhibition of larger amounts, and have seldom found it necessary to repeat the dose. The hydrochlorate or hydrobromate are the most efficient and least disagreeable in their after effects, though more expensive than the sulphate.

When aqueous solutions of quinine and chloral are mixed, a white, pasty precipitate is thrown down—a fact to be remembered when prescribing these two drugs.

Gossypii Radix.—A decoction of cotton-root has long enjoyed a reputation among the negroes of the South as an abortifacient and oxytocic. From some of the statements published, there would seem to be good reason for regarding it as energetic as ergot. I have never employed it as an oxytocic, and it is needless to say never as an abortifacient, though in metrorrhagia from subinvolution of the uterus I have used it extensively and with the best results. Indeed, a favorite prescription of mine for the condition just referred to contains equal parts of fl. extr. gossypii radix and extr. ergotæ fl., with a smaller proportion of cannabis indica. The dose of the cotton-root is from half a drachm to a drachm of the fluid extract of the root every two to three hours. The decoction of the root is made by boiling four ounces of the inner bark in one quart of water until reduced to one-half. The dose of this is a wineglassful every twenty to thirty minutes.

Viscum Album.—The fluid extract of mistletoe has properties much resembling those of ergot, though, while it produces energetic contractions of the muscular fibres of the uterus, it does not tetanize them, and, consequently, may be given when ergot would be dangerous. Though not as reliable as this drug, I have used it with great benefit in doses of from one-half to one drachm every half or three-quarters of an hour, up to three or four doses, in cases where the uterine contractions were sluggish, or to check menorrhagia from subinvolution in cases where ergot disagreed. It should be mentioned that the inspissated extracts of gossypium and viscum album act equally well in suppositories.

Viburnum prunifolium: V. opulis.—Black Haw is supposed to have a specific action on the uterine muscular fibre diametrically opposed to that of ergot and other oxytocics, namely, a sedative effect. Experience has shown that it is one of our most valuable epichontocics, its special indications being in threatened abortion, in premature labor and in dysmenorrhœa of the spasmodic variety. I consider it a standby where the symptoms are not very

[1] Campbell: *Gynecol. Trans.*, Vol. V, 1880, p. 293 *et seq.*

threatening—as in habitual abortion—and using it in connection with rest and morphia, have gotten the most satisfactory results.

Viburnum is particularly applicable in those cases where morphia is contra-indicated, and, though rather unpleasant to the taste, is well borne, even by the most delicate stomachs. It may be given in doses of a drachm, every fifteen to thirty minutes, up to a half-ounce.

Cocaine Hydrochlorate.—I have found this drug chiefly useful as a sedative agent in the nausea and vomiting of early pregnancy, where it produces surprising effects, given in a dose of from one-twentieth to one-tenth of a grain; a very elegant means of administering it being in the gelatine capsules now prepared by pharmacists. In obstinate pruritus vulvæ a four per cent. oleate locally applied will often relieve when all else fails. The oleate is also useful in the treatment of fissured nipples. As a local anæsthetic in labor I do not believe it to be of much value, the surfaces involved being too extensive, and its effect too superficial and evanescent.

Hyoscyamine Sulphate.—Hyoscyamus, in obstetric practice, has been used as a local anodyne application to inflamed and painful breasts, with practically the same effects as those obtained by the use of belladonna, and its alkaloid as a sedative and as a "vegetable strait jacket" in acute post-puerperal and other forms of mania. I had not heard of its use during labor until, recently, Dr. Wells spoke to me of a case where he had used the hyoscyamine sulphate as a sedative and anæsthetic, with good results, a marked oxytocic effect being noted.

The patient was a young and healthy primipara, but was exceedingly excitable and hysterical. The first stage progressed slowly, the uterine contractions being painful and inefficient. When the os was about three-fourths dilated, the patient having been in labor about twenty hours, she became perfectly frenzied, shouting and screaming in an insane manner, and throwing herself about so violently that the assistance of several persons was necessary to prevent her from doing herself severe bodily injury. It was known that she did not bear morphia well, and thirty grains of chloral previously given had produced such cardiac depression that it was not considered safe to give her more, and having a solution of hyoscyamine sulphate (Merck's) with him, Dr. Wells injected a tenth of a grain hypodermically. In between five and six minutes the excitement had subsided, the pupils became dilated, voluntary muscular motion was enfeebled, the face began to show the characteristic hyoscyamine flush, and soon the patient passed into a deep sleep; the respirations became full and slow, and the pulse, which had been rapid and rather weak, slow, strong and regular. The effect on the uterine muscle was watched with much interest; the contractions, slightly increased in frequency, became much stronger and much more efficient, so that at the end of an hour the patient was delivered of a fine boy, weighing 8 lbs., 8 oz. There was no hemorrhage, the placenta and membranes were

spontaneously expelled fifteen minutes after the birth of the child, the uterus immediately contracting firmly and permanently. The patient remained absolutely anæsthetic during the delivery, and for nearly an hour after, when the effects of the hyoscyamine began to pass away, though she slept most of the time for three hours. She awoke feeling refreshed, was perfectly rational, but would hardly believe that she had been delivered, until she was shown her child. There were no unpleasant after effects whatever, except a slight paralysis of ocular accommodation, lasting about six hours. Convalescence was normal.

Dr. Wells was led to give the drug in this case from his observation of its good effects in acute post-puerperal mania, and did not know of its ever having been used during labor. From its known slightly stimulant effect on unstriped muscular fibre he had expected that it at least would not weaken the muscular contraction of the uterus, but he was agreeably surprised at the marked oxytocic effects noted. As the strength of the drug varies somewhat it is well to assure ourselves of the activity of any particular specimen, by the use at first of smaller doses, they being repeated if necessary.

The salts of *hyoscine*, especially the hydrobromate, from results observed in other departments of medicine, will probably prove useful in many cases where chloral is now used, and certainly deserve trial. They may be used in doses beginning with one-sixtieth of a grain, increased cautiously, as may be necessary.

Electricity.—No one in this age of progress can dare to say where or when the limits of electric power or application will be reached. In medicine, as well as in the other branches of scientific research, new uses and properties are continually being discovered. To the obstetrician its study is of considerable interest, practically as well as theoretically, and though its known uses in this department are many and valuable, more probably remain to be discovered.

One of the greatest objections to its use, and one which has practically confined it to the office or hospital, is the bulk and weight of the apparatus necessary for its production; both of these disadvantages, however, have been of late considerably reduced.

It requires no special talent and no prolonged study of its mysteries to enable an obstetrician who is competent to correctly diagnose his patient's condition, and deduce therefrom the proper indications, to employ electricity with safety and benefit.

The apparatus need be neither complicated nor very expensive, a reliable faradic apparatus and a portable galvanic battery of from twenty to thirty cells, with current interrupter and reverser, electrodes and cords, being all that is necessary.

Of electrodes we need five: two round, flat sponges about two inches in diameter, fastened on metal disks which are screwed into universal wooden

handles, to which the conducting cords are attached; to be used for external application over small portions of the skin of the abdomen or back. A large flat sponge, six by three inches in size, covered on one side by rubber cloth, which slightly projects beyond the edge of the sponge, and provided with protected metal attachment for the connecting cord, to be used where we wish a larger surface to be included in the current. A bracelet electrode for attachment to the wrist when the hand is used as an electrode; and a metal electrode with a ball about one inch in diameter, attached to a steel sound covered with elastic catheter, and furnished with a screw for attachment to the universal handle; this is used for applications to the cervix and vaginal vault, and through them to the uterus and adnexa, and should be covered with tight-fitting chamois leather, which should be renewed for each case, the covering preventing the escharotic effect observed at the negative pole of a galvanic current when the current is strong and continued for some time (over sixteen cells, and longer than five minutes). The sponge electrodes may, for purposes of cleanliness, have a piece of canton flannel tied over them, which may be changed at each time of use. These electrodes, while being used, should be kept well moistened with warm water, to which a little salt has been added.

It should be remembered that the fresher the fluid in the battery the more powerful will be the current, and the oftener and longer the battery is used, the weaker it becomes, so that more cells have to be used to produce the same effects. When the constant current produces pain it is too strong or is doing harm, and should be reduced in strength or stopped.

Either the galvanic or faradic current may be employed with about equal results in the following conditions: *vomiting of pregnancy, to induce premature labor, to destroy the life of an extra-uterine gestation, as an oxytocic in normal or complicated labor, in subinvolution.*

In the *vomiting of pregnancy* the electric current may be used with considerable advantage where the condition causing it is purely neurosal in character. A moderately strong current is necessary, which may be applied in each of several ways; thus a current may be passed directly through the body, one electrode being placed over the epigastric region and the other on the back, or both electrodes may be placed a little distance from each other on the abdomen over the stomach, or one electrode may be placed at the angle of the jaw and the other at the epigastrium, or both may be applied to the spine, or one placed at the epigastrium and the other rubbed over the course of the spine, the current being either continuous, interrupted or reversed. I have found the last method, with the galvanic current slowly interrupted or reversed, to produce the best results. Lente was, so far as I know, one of the first to employ faradism for this purpose.

In *the induction of premature labor*, electricity is used with a certain measure of success and perfect safety, though it often fails to accomplish its end. The application is made by placing the vaginal electrode against the cervix and the small sponge on the abdominal wall, over the fundus, using

a pretty strong galvanic current slowly interrupted. The external electrode should be moved about with a pawing motion, and, to prevent the formation of an eschar, the position of the cervical one changed occasionally. The current should be passed for about fifteen minutes, and repeated five or six times, each time a little stronger, at intervals of a few hours. This treatment causes the cervix to dilate and regular uterine contractions to set in. The faradic current may also be used, but does not seem to produce as good results; it would seem to be indicated especially when the cervix has already been dilated, to incite stronger uterine contractions.

The electric treatment of *ectopic gestation* is discussed in Article XIV, to which the reader is referred.

As an Oxytocic.—Though I have used it but little for this purpose, for reasons above stated, there is but slight doubt in my mind that electricity is the best and most manageable of oxytocic agents. Its value in the treatment of conditions of uterine inertia has been recognized for some years, though but superficially referred to in all modern works on obstetrics.

It is well known that when passed through the uterine muscle, it adds to its strength and tone, increasing the vigor of its contractions, thus favoring a more rapid dilatation of the os and shortening the time of labor; and that in post-partum hemorrhage from an atonic uterus, it is the most certain and valuable agent which we can use, stopping the hemorrhage, by producing an almost instantaneous uterine contraction.

Baird,[1] in an elaborate paper recently published, giving results obtained by him by the use of faradism in some 220 cases, claims, in addition, and proves pretty conclusively, that electricity, properly used, will lessen the pain of the uterine contractions, and, by preventing an undue expenditure of nervous force, diminish shock and exhaustion in cases of debility from any cause, thus leaving the patient in the best condition to secure speedy and favorable convalescence.

From our present experience, a viable fœtus does not seem to be affected injuriously by the faradic current if the current be not excessively strong or passed directly through its head; for this latter reason, we should avoid placing an electrode against the head or in the vagina.

The best method of its application, the one described by Baird, is as follows: The patient is placed in the dorsal position, and the cords attached to the electrodes; one, the large, flat sponge, being applied to the sacro-lumbar region; the other, the bracelet, attached to the wrist, first covered with a napkin wet with warm water, of the hand with which the application is to be made. The battery being now set in action, the circuit is closed by the application of this hand, also wet with warm water, to the abdominal parietes. The application made in this way enables the operator to correctly estimate the strength of the current which he is applying, and, the hands being more sensitive to the current than the abdominal walls, as long

[1] *Am. Jour. of Obstet.*, vol. xviii, 1885, p. 337 *et seq.*

as he continues the operation through his hand there will be no danger of producing any unpleasant effect upon his patient; on the contrary, a current as strong as can ordinarily be borne by the operator's hand will produce a pleasant and soothing effect. He can also note the exact condition of the uterus, the changes which occur in its contour, and the amount of increase which occurs in its contractions; he is enabled to perform uterine manual pressure, and should it be necessary to use both hands for this purpose, it can readily be done, each hand then conveying the current to or from the uterine walls.

It is always best to begin with very mild currents, and to increase them gradually to the required strength. The application of the hand should be continuous until a sufficient amount of sedation is produced (from five to thirty minutes), when it should be removed in the interval between the contractions, the circuit being closed again when the pain recurs. *When all reflex pain has been subdued, and the patient rests well in the intervals, keep the circuit closed only during the time occupied by the rhythmical contractions of the uterus.* The danger of destroying the electro-muscular contractility of the uterine fibre, which we wish to strengthen and stimulate, and which would probably be paralyzed did we keep the circuit closed continuously, is effectually guarded against by the intermittent application. Dr. Baird has used it in this manner for twenty-four hours in a case of tedious labor, "and during all this time it furnished to the nerves and muscles all the elements of increased *strength* and *rest*, as was fully evinced by the ability of the patient to withstand her pains, and by her earnest desire, often reiterated, not to allow her to have a pain without closing the circuit."

When the operator is tired, or it is necessary to support the perineum, the nurse can make the applications.

At the beginning of the second stage the current is increased in force as much as the patient can bear with comfort, and it will be found that the stronger the current used in this stage, short of producing spasmodic contractions of the abdominal muscles, the better it will suit the feelings of the woman. When the perineum is well dilated, the force of the current should be moderated, and when there is reason to fear danger to its integrity, withheld entirely, so as to give time for its safe dilatation. After the head has escaped, the circuit is to be closed most of the time, until the third stage is completed, which will usually be in a very few minutes. In all of Dr. Baird's cases the placenta has been expelled in from one to ten minutes from the birth of the child, with very slight traction upon the cord.

In *subinvolution*, which may exist from three to six months after a confinement or abortion, the uterus is abnormally large, soft, succulent and vascular; both its muscular and vascular elements require contracting, and the circulation needs stimulation, in order to hasten the normal retrograde metamorphosis. Therefore, the *faradic* current is especially indicated. But if the subinvolution is less recent, and the uterus has become somewhat dense and hard, the constant current will act very well in promoting absorption of

the adventitious elements. The rapidly interrupted *constant* current will often be found more useful than the faradic in these cases.

As subinvolution is usually accompanied by menorrhagia, or even metrorrhagia, it is best not to irritate the endometrium by sounding; hence, intrauterine electrization should be avoided, the current being passed through the ball electrode applied to the cervix.

Frequent, mild sittings are necessary, except where there is menorrhagia, when the strongest faradic current only should be given, in order to produce as powerful a contraction of the uterus as possible. Usually, however, the effect will be gradual, and only little by little will the uterus diminish and the profuse flow decrease.

II.

POSTURE IN OBSTETRICS.

A STUDY of posture in its relations to obstetric practice will naturally include those positions that sometimes may be advantageously given to the patient as accessory or directly curative measures in the treatment of certain malpositions of the fœtus, the various attitudes in which delivery may be accomplished and the postural treatment of the puerperal state.

An intelligent understanding of the *rationale*, use and effect of various postures in certain abnormal conditions will often enable us to find the means of remedying others by the same or similar measures. Thus, when the head at the superior strait is not properly or sufficiently flexed, lying in any position between the normal and face, we can often, by merely placing the patient in the lateral decubitus on the side toward which the occiput points, cause the wished-for flexion to occur.

With the chin posterior, the mother may be placed upon the hands and knees, and kept in this somewhat awkward position during several pains, when examination will often reveal the vertex; the *rationale* of the procedures being, that we place the mother in such a position that the weight of the child transmitted to the base of the skull tends to press it toward the side where the occiput lies, and, therefore, to give it the position of flexion. These postures may be used advantageously in conjunction with manual efforts at cephalic replacement.

In shoulder presentations the decubitus on the side toward which the head is displaced, the pelvis at the same time being somewhat elevated, will often allow us to perform cephalic version after the manner of Hicks with remarkable ease, and even in neglected cases, where podalic version would seem to be the only resource, we can often, by placing the patient in the genu-pectoral position, and thus causing the weight of the fœtus and the abdominal contents to aid instead of oppose our movements, bring the head to the brim; and, indeed, several cases are reported where, in shoulder

presentations, spontaneous version has occurred after placing the patient in this position.

Again, when the uterus lies in such a position of lateral obliquity that the contractions act at a disadvantage, forcing the head more against the pelvic walls than downward, we can remedy the condition by the appropriate lateral decubitus, the change from back to side always producing marked improvement in the efficiency of the pains.

When our examining finger detects through the unruptured membranes the pulsating loop of the umbilical cord, postural treatment is of the greatest value and should always be resorted to, the patient being placed so that gravity removes the weight of the child and abdominal viscera from the pelvic brim and tends to cause the cord to slide back into the cavity of the uterus, these ends being best accomplished with the patient in the knee-breast position, the reposition being aided by gently moving the abdomen to and fro. This position should also be assumed when the membranes have ruptured and where instrumental reposition becomes necessary, it rendering it much more certain and facile. After reposition has been accomplished, the woman may again resume the dorsal or lateral decubitus, the transition being made during a pain, when the head, forced against the pelvic opening, prevents the fresh prolapse of the funis. To Thomas belongs the credit of popularizing this method, he having first used it in 1858.

During the first stage of labor, and until the os is nearly fully dilated, or the head low down in the pelvic cavity, the parturient may safely be left to follow her own whims in regard to posture. When the first teasing pains appear, she is apt to sit, and in such a position that she can press with the hands upon the sacrum or sides of the pelvis. As the contractions become more frequent and stronger, she becomes restless and walks about, on the approach of a pain grasping a support, leaning forward and sometimes pressing the abdomen against any convenient object, as a table, or chair back, or the footboard of the bed. She should be allowed and encouraged to move about in this way until the first stage is nearly complete, the changing position being less irksome, and the weight of the child most advantageously disposed to favor dilatation. The pains, also, are more active, seeming to be stimulated by the movements of the mother. When the os is entirely dilated in a primipara, or three-fourths to four-fifths in one who has borne children, as a very few pains may now complete the labor, she should be placed so as to best facilitate the expulsion of the child.

The customs and traditions of various peoples, ancient or modern, civilized or savage, as to what this best position may be,[1] form a very curious and interesting study: standing erect; hanging more or less suspended from a tree or rope, or the neck of some friend; sitting erect on a cushion, stool or stone; squatting; kneeling on the knees and hands, knees and elbows, knees and breast, or with the body bent backward; sitting semi-recumbent on the

[1] A valuable paper, giving the results of very thorough research on this subject, was published by Geo. J. Engelmann, of St. Louis, in the Trans. of the Am. Gyn. Soc. for 1880, entitled "Posture in Labor."

ground or on some support, as a stone or stool, or on the lap or between the thighs of an assistant, on the obstetrical chair; lying semi-recumbent; lying horizontal on the back, side or stomach. All these positions and others are used, the various semi-recumbent ones being far more commonly adopted than the erect or horizontal, except throughout Europe and the United States, where the horizontal or lateral decubitus is nearly universal.

In England the women are almost always delivered on the left side, even in instrumental cases, the supposed advantages being that the patient is less exposed, and that the perineum can be more easily watched and supported. In this country and on the continent of Europe the dorsal position is most favored. In so far as exposure is concerned I cannot see that there is much difference, with the patient properly clothed with drawers and stockings, between the dorsal and lateral positions, except that the patient in the latter cannot see the extent of her nakedness or the manipulations which may be necessary. In regard to the advantages claimed for the respective positions, digital exploration may be performed with the patient in either with equal facility, while palpation and auscultation of the fœtal heart can be much more easily and thoroughly accomplished in the dorsal decubitus. When the head reaches the pelvic floor the left lateral position is thought by many to be the most favorable one for attempting measures for the support and preservation of the perineum, the advance of the head being more easily regulated and the degree of perineal tension more exactly appreciated. To the beginner in obstetric practice the regulation of the advance of the fœtal head seems more easily accomplished in this position, but the physician soon learns to attain his purpose with equal facility and certainty with the patient in either decubitus. The thigh muscles are more relaxed, and the abdominal muscles act to a somewhat better advantage in the lateral than in the *horizontal* dorsal decubitus, but in neither so well as in the dorsal *semi-recumbent* position, now to be described.

This position, or its various modifications, so often assumed by the women of savage peoples who, not being bound by the tradition and restraints of civilization, follow their natural instincts in physiological acts, is one which any obstetrician has seen many times assumed in the agony of expulsive effort, when the patient grasping any person near or resting on the hands or elbows, raises the shoulders and upper part of the body from the bed. Many times, in labors which were slow, the pains being inefficient, and where turning the patient from back to side has not produced any effect in increasing their force (oftentimes a change in posture will increase the pains), causing the patient to sit or recline with the body at an angle of thirty or forty degrees has produced an almost immediate termination of the labor. And again, where the pains were strong but not effective, the woman has begged to be allowed to sit up or kneel, and permission being given, the child has been born at once. Even where it has been considered advisable to apply the forceps, the child has been expelled as soon as this posture was assumed. I might cite numer-

ous instances of the benefits resulting from this position, but enough has been said to show my meaning.

There need be no unusual exposure, the position is comfortable, the pains seem to be less severely felt, the thigh muscles are very perfectly relaxed, the abdominal muscles can contract more forcibly and to better advantage, and the weight of the child and superimposed viscera aid the uterine contractions. My preference, for most cases, and for the reasons given, is in favor of the *dorsal semi-recumbent* position, the shoulders and body being raised to an angle of about thirty-five or forty degrees, which can easily be done by raising the mattress on the back of an overturned chair placed under it at the head of the bed, or by other simple means which readily suggest themselves.

Every physician should accustom himself, however, to examine and to deliver patients on either the back or side, it often being to his interest to deliver the woman in whatever position she may have been accustomed to in former confinements; and often in tedious labors a change in posture is both pleasant and resting to the mother and stimulating to the pains. Should the patient be delivered on the side, the dorsal decubitus should be assumed after the completion of the second stage, for in that position the remaining contents of the uterus are more easily expelled, either by natural efforts or by Credé's method, the uterus is more conveniently and easily held and compressed, and hemorrhage more surely guarded against.

Any one who has held a flaccid uterus after delivery for any length of time with the patient on the side, and again with her on the back, will appreciate forcibly the truth of these remarks, as well as the advantage of the dorsal decubitus.

In instrumental deliveries or where podalic version is to be performed, the woman should lie flat upon her back with the nates just at the edge of the bed, and the legs either held by assistants or supported on chairs. Though the forceps could as easily be applied and traction as easily made in the lateral position, abdominal manipulations, which are often of the greatest value, can only be awkwardly and imperfectly performed with the subject in this decubitus.

After labor the woman should be kept strictly in the recumbent position for a number of days, generally from seven to nine, or until the uterus has become involuted, so that it no longer is felt above the pubis, being allowed to lie on the back and on either side alternately, the choice of the position being oftentimes influenced by some prëexisting displacement of the uterus, the puerperal period being peculiarly favorable for its treatment; thus, when we know that the patient had before gestation a retroversion or flexion of moderate degree, we can often, by causing her to lie alternately on either side and not on the back while the uterus is large and heavy, rectify the malposition, and by fitting a pessary before the patient walks, and letting her wear it for several months, we occasionally get a permanent cure.

When the retro-displacement has been very marked, it is advisable to keep the patient in the lateral recumbent position, preferably dressed and on a lounge, so as to avoid the evil results of confinement to bed for a long time and until the uterus has become involuted to such an extent that it will not bend over the posterior bar of the pessary when the patient walks about, as it is extremely apt to do while it is large, soft and flabby, involution being accelerated by ergot at the same time that the vaginal walls are made more tolerant by the use of astringent tampons and injections. A pessary should be fitted as soon as possible and worn for months.

In ante-displacements the patient should be encouraged to lie on her back, and a suitable pessary fitted after ten or twelve days.

Where there is a tendency to descensus, the patient should be kept in the horizontal position, and where the displacement is marked, should have the hips somewhat elevated. She should not be allowed to stand erect or walk until involution is well advanced, and in this case, as in the other, astringent tampons and douches prepare the way for the pessary, which probably will be needed.

Dr. Goodell, of Philadelphia, allows his patients to get up on the fourth or fifth day after confinement, and states that he finds no evil consequences resulting from the practice. I believe that, while in many cases no harm might result from so doing, in others, allowing the patient to walk about while the uterus is still so large and heavy would be a very risky proceeding, tending strongly to increase any existing displacement, and even to produce one where none had existed before.

REPOSITION OF THE GRAVID UTERUS BY POSTURE AND ATMOSPHERIC PRESSURE.

In the month of January, 1876, a patient came to me complaining bitterly of symptoms which pointed towards a displacement of the gravid uterus.[1] A vaginal examination revealed the uterus in a state of acute retroflexion, the enlarged body and fundus occupying the cavity of the sacrum, and firmly compressing the rectum and the cervix, situated under the symphysis pubis. Below the fundus was the enlarged, exquisitely sensitive left ovary. The size of the uterus and the soft, doughy feel of the body, indicated a pregnancy of about ten weeks; while the tenderness of the organ on pressure clearly showed the necessity for speedy interference and the reposition of the dislocation. The symptoms of incarceration were not present, that condition generally not arising until the end of the fourth month, and although the existence of a retroflexion fortunately prevented the compression of the urethra by the cervix uteri and the consequent partial or total retention of urine, which would doubtless have been present had the case been one of retroversion, still, two cases of miscarriage during the tenth and twelfth weeks, in which the reposition of the retroverted uterus and a lever pessary after the commencement of the metrorrhagia proved

[1] Reported in *American Journal of Obstetrics*, June, 1876. Trans. N. Y. Obs. Soc.

unavailing, had shown me the danger of abortion, even at that early period, unless the displacement was soon reduced. I at once placed the patient in the genu-pectoral position and introduced two fingers of my right hand into the posterior cul-de-sac of the vagina; this not succeeding, I passed the same two fingers into the rectum, and endeavored, for about five minutes, to dislodge and push the body of the uterus above the brim of the pelvis, but without success. The complaints of the patient and the fact that her bowels had not moved for several days, induced me to desist from my efforts and to send the patient home, with instructions to thoroughly evacuate the bowels and to return the next day with an empty bladder. She did so, and I renewed my efforts as before, but having used as much force as I dared, and having caused great pain, I found that I had not succeeded in elevating the fundus at all, and that the cervix still retained its original position above the pubic arch. Having, in a number of cases of retroflexion or version of the gravid uterus, succeeded, without difficulty, in replacing the organ in the manner indicated, I thought that there must be some special reason for my want of success in this case—perhaps adhesions, which were possible, since the patient could not date the displacement to any sudden accident; and it might, therefore, have existed for some time before the present impregnation took place. I determined, however, to try, first, whether, by drawing the cervix away from the pubis and toward the floor of the pelvis, I could not dislodge the fundus and reduce the dislocation by simultaneous digital pressure per rectum. This I had already tried with the finger, but without avail. The patient being still in the genu-pectoral position, I introduced Sims' speculum into the vagina, and pulled up the perineum sharply, intending to seize the cervix with the double tenaculum, when I suddenly noticed that the vagina was distended with air, like a balloon, in the middle of which appeared the cervix. On looking for the body of the uterus, I found, to my surprise, that it had disappeared, that the sacral excavation was empty, and that the obstinate retroflexion of the gravid organ had been unwittingly and painlessly reduced. The patient immediately expressed her sudden and entire relief from the previous distressing symptoms, and I hastened to secure the uterus by introducing a proper Albert Smith pessary, which the patient wore with perfect satisfaction and comfort until the beginning of the fifth month.

The explanation of this phenomenon is perfectly simple and obvious. The forcible elevation of the perineum opened the introitus vaginæ, and gave entrance to a volume of air, the pressure of which had already been pushing up the perineum, slightly drawn inward by the downward gravitation of the abdominal viscera, and the pressure of which, when admitted, instantaneously distended the vaginal pouch and replaced the uterus—a mechanism identical with that on which the action of Sims' speculum was founded. However, I did not remember seeing this method of reposition of the retrodisplaced uterus, gravid or unimpregnated, recommended in any of the works on obstetrics or gynecology, and, on looking over those at my disposal, such as

Scanzoni, Schroeder, Byford, Cazeaux, Leishman, Thomas, Barnes, Hewitt, I found that while all recommend the usual manipulations for the reduction of retroflexions and retroversions of the unimpregnated and gravid uterus, as by fingers in the rectum or vagina, or by air or water-bags in these passages (Favrot); or by pressing the fundus up with a drumstick or ivory-headed cane in the rectum (Byford); or by drawing down the cervix with one hand, while the other pushed up the fundus, the patient generally being in the knee-chest or semi-prone position; and, while all these authors agreed that the reposition of the uterus with the sound was always attended with more or less danger and pain, still, not one even as much as hints at the employment of atmospheric pressure for this purpose. Even Sims himself, whose attention might naturally have been supposed to be directed to this manner of replacing retro-deviations, from the manner of the discovery of the principle of action of his speculum, entirely ignored the method, recommending the reposition of the retro-displaced uterus by the fingers and three sponge-holders, or by the uterine elevator. I afterwards found that T. A. Emmet had noted, in an article which appeared in the *American Journal of Obstetrics*, February, 1869, entitled, "Surgery of the Cervix, in Connection with the Treatment of Certain Uterine Diseases," a case where he had replaced the retroverted non-pregnant uterus in a similar manner to that above described. During a discussion on a paper by Dr. Fred. H. Gervis, on "Retroversion of the Gravid Uterus," at the meetings of the London Obstetrical Society, in November and December, 1884 (*Obstet. Jour., G. B. & I.*, December, '74, and January, '75), which was the latest published general discussion on the subject, Barnes, Wynn Williams, Aveling, Gallabin, Braxton Hicks, Palfrey, Godson, Edis, Hay and others, related their experience in forty-eight cases, eight of which were fatal, and the treatment employed and advocated, but not one word of air-pressure as a repositor do I find among all the methods recommended. It is evident that none of the gentlemen named had ever heard of it in that connection.

On January 6th, two days after the reposition of the displacement, as above described, the latest number of the Berlin *Beiträge zur Geburtshülfe und Gynäkologie* (Vol. IV, No. 1) came into my hands, and looking it over, I noticed an article entitled, "A Hitherto Unrecognized Obstacle to the Reposition of the Retroflexed Gravid Uterus," read by Dr. Solger, of Berlin, before the Obstetrical Society of that city, May 11th, 1875, in which, after enumerating the various well-known obstacles to the reposition of the retro-displaced gravid organ, such as distention of the bladder and rectum, projection of the sacral promontory and impaction of the fundus in the sacral excavation, and retro-uterine adhesions, mentions a new, hitherto not recognized impediment, viz., the normal intra-abdominal pressure, and relates his experience in a case of difficult reposition, in which he made exactly the same observations as I had done, although in a slightly different manner, identical with the original observation of Dr. Sims. In one case of irreducible retroflexion of the gravid uterus at the end of the fourth

month, in which Solger vainly endeavored to replace the organ by the fingers and the colpeurynter, in the knee-chest position, he seized the cervix with the double tenaculum, to draw it away from the pubis, and while examining with the finger to see whether the tenaculum was in the right place, the cervix and tenaculum suddenly made a spontaneous evolution, and the cervix was found high up in the sacral excavation, from which the fundus had disappeared.

Solger concluded that this voluntary reduction was owing to the influence of the negative intra-abdominal pressure in the knee-chest position, and was reminded of a case of severe incarceration, in which violent emesis, in the knee-chest position, brought about the spontaneous replacement of the uterus. Still, he was not completely satisfied with this explanation, which I regard as the true one, and it was not till about a month previous that a new case afforded him an opportunity for ascertaining what he considered the true rationale of this phenomenon. After repeated unsuccessful efforts to replace the retroflexed uterus of three and a half months, in the knee-chest position, with the fingers in the rectum and vagina, Solger again introduced his fingers into the vagina, for the purpose of drawing the cervix away from the symphysis, when he heard and felt the air rush into the vagina between his fingers, which at once found themselves in a large balloon-like space, bounded above and behind by the sacrum. The retroflexion was completely replaced! This unexpected and surprising result he attributed to the overcoming of the intra-abdominal pressure, equal to at least one hundred pounds, by the atmospheric pressure, which, taking the antero-posterior diameter of the superior pelvic strait at only 8 cm., or 3", at fifteen pounds to the square inch, amounted to more than one hundred pounds, aided by a negative intra-abdominal pressure not exceeding, according to Schatz, 10 cm. hydraulic pressure, and the weight of the uterus itself. He recommends to replace all retroflexions of the gravid uterus by placing the patient in the knee-chest position and admitting air to the vagina. Only in case of this manipulation failing to be successful, is the employment of manual or instrumental pressure justifiable.

Solger's explanation of the *modus operandi* of the method is not in all points correct; for while in the knee-chest position the intra-abdominal pressure is removed and a negative pressure substituted, by reason of the gravitation of the abdominal viscera away from the pelvis, there is no such enormous force acting as the one hundred pounds of atmospheric pressure which he speaks of, the entrance of air into the vagina merely balancing the upward pressure of the atmosphere by removing the tendency to the formation of a vacuum, which there would be if the uterus should replace itself with the vagina closed, and allowing the downward pull exercised by the weight of the viscera and the uterus itself to act, precisely as in the classic experiment with the Magdeburg Hemispheres, which, though they can only be separated by enormous force so long as the vacuum within is maintained, drop apart when air is admitted.

Dr. Henry F. Campbell, of Augusta, Ga., had at this time written a paper bearing upon my subject, entitled, "Position, Pneumatic Pressure and Mechanical Appliance in Uterine Displacements" (*Atlanta Med. & Surg. Jour., May*, '75), in which he said that although the knee-and-breast position had been known and practiced in reducing uterine displacement for many years, it was but little appreciated, and that no one had mentioned "the indispensable condition of power and the real instrumentality and *sine qua non* in the process of replacement, the *pneumatic* pressure." He recommends the employment of the knee-breast position and pneumatic pressure together in all varieties of uterine displacement, not only to aid the diagnosis and replace the dislocated uterus preparatory to introducing a pessary in the same position, when it can be gently laid on the posterior vaginal wall without forcibly pushing up the displaced organ (the only way in which a pessary should be applied), but chiefly for the purpose of enabling the patient to reduce the dislocation herself every evening before retiring to bed, and thus secure an unimpeded uterine circulation with unstretched uterine ligaments during the whole night, a process which, if regularly repeated for some time, will, he asserts, "go far in favoring a restoration to a permanently normal position of the organ." This self-replacement is rendered practicable by means of the "pneumatic self-repositor," a glass tube with slightly curved bulbous extremity, made of different sizes, which the patient introduces every night in the knee-breast posture, only for a moment, when "the air rushes in, the suction is broken, and immediately, whatever may be the displacement, unless there is adhesion or impaction, self-replacement is completely and instantly accomplished."

Dr. Campbell also advises the postural and pneumatic pressure treatment in the various forms of displacement of the gravid uterus, which "are not only incident to, but are almost normal attendants of, the earlier months of pregnancy;" and is confident that many of the discomforts and dangers accompanying these conditions will be alleviated or removed by nightly "self-replacement."

Rectal inflation was also recommended by Dr. Campbell, as it is by Dr. Emmet (*loc. cit.*), as serviceable in some cases, "to dislodge the fundus from the hollow of the sacrum, thereby making restitution by vaginal inflation and inverted gravity easier and more certain."

A very important, distressing and peculiarly obstinate class of cases in which postural treatment alone is of marked benefit are those in which one or both of the normal or enlarged and congested ovaries have slipped down behind the uterus, and produce the most agonizing torture at almost every movement of the patient. Dr. Campbell entirely omits all mention of these displacements, although they are very common in connection with those of the uterus. I am confident that the knee-breast position—particularly if reinforced by the admission of air to the vagina—will prove very soothing and beneficial in these cases.

While Dr. Solger's observation differed from mine, in that he did not recog-

nize the advantage offered him by the employment of Sims' speculum for the admission of air to the vagina—and this is by no means a mere nominal advantage, as I have ascertained by experiment, for it seems almost essential to a complete distention of the vagina to lift up the perineum—it will be seen that Dr. Campbell covered all the ground, with one exception, that I had expected to occupy when I first made the independent observation in the case which I have recorded. I must say that, having since replaced many retroverted non-gravid uteri by the postural and pneumatic method, I am very much impressed with the truth and force of Dr. Campbell's statement; and while the subject of "nightly self-replacement" may, perhaps, meet with some opposition, on æsthetical and moral grounds, I do not hesitate to express my unqualified support of the principles of treatment advocated and my belief that its universal appreciation and adoption will be of great benefit to the suffering female sex. And especially would I call attention to the value of the admission of air to the vagina, conjointly with the old-established postural treatment, in reduction of retro-displacements of the gravid uterus—even of a severe degree—where the employment of an amount of force such as would be perfectly justifiable in case of adhesion of the non-gravid womb, would surely be productive of peritonitis or abortion. This particular class of cases was not referred to by Dr. Campbell; indeed, he excepts displacements, where there is adhesion or impaction, as not amenable to the beneficial influence of these measures. Solger's and my cases both prove that the latter condition, in its commencing stages, may often be readily relieved by this method. I need scarcely mention, therefore, that all the milder cases of this accident are, as a matter of course, controlled with correspondingly greater facility, and I believe that, only after posture and atmospheric pressure—employed in the manner described by me, knee-breast position and elevation of the perineum with Sims' speculum—have failed to reduce the dislocation, are the usual, and infinitely more difficult and painful, manipulations to be resorted to.

III.

EXTERNAL OBSTETRIC MANIPULATION.

WHILE this article will not be as exhaustive in many respects as my paper (pp. 114) which appeared in the *Journal of Obstetrics*, in 1879 and 1880, I trust that it will be found to contain all that is necessary to a comprehension of the subject.

In justice to myself, I should state that my former paper was substantially written in 1871–2, while I was in Vienna, seven years before the publication of the work of Dr. Pinard,[1] but other momentarily more pressing work delayed its revision and publication from year to year.

[1] A Treatise on Abdominal Palpation: Pinard. Paris, 1878. Translated by L. E. Neale, M.D. New York: J. H. Vail & Co., 1885.

In the short space here allotted, I can only very briefly refer to the historical portion of the subject.

While used in a rude way from very early periods, it was not until 1668 that Mauriceau first described methods of exploration by external manipulations that could lay claim to any scientific value, and though after this, Roederer, Puzos, Levret, Jörg, Baudelocque, Kiwisch, Holst, Veit and others,[1] laid stress on its importance and improved its methods, it is only within a comparatively short time that the recognition of its value and its use has become general.

The first methodic and scientific account of version by external manipulations was published in 1807, by Wigand, of Hamburg. Those who wish to collect all the literature of the subject up to 1859, I refer to Dr. Nœggerath's paper.[2] That the therapeutic application of external obstetric manipulation has attracted much greater attention than mere diagnostic palpation, is apparent from the great number of authors who have written on the subject.

External obstetric examination and manipulation may be employed both for the purpose of *diagnosis* and for *treatment*.

I.—DIAGNOSIS.

The several practical subdivisions of the procedure when used for purposes of diagnosis are: *Inspection*, *palpation*, *percussion* and *auscultation* (page 252) of the abdomen, each of these measures controlling and supplementing the others, and all combined giving certainty to the examination.

The proper period for making the examination is at any time during the last month of gestation, in order that any malpresentation or abnormal condition may be detected and rectified previous to the inception of labor, or, at least, suitable preparations made to meet the probable difficulty. It is also the first duty of the physician when called to an obstetric case, to examine by external manipulation, even before he makes the controlling vaginal examination.

Preparation for Examination.—The woman, when examined, should be placed in the *horizontal dorsal decubitus, with head slightly elevated, inferior extremities somewhat flexed, abdomen exposed from pubes to epigastrium, and bladder and rectum empty.* Corsets, all constricting bands about the waist, and drawers should be removed. Any covering, however light, over the abdomen interferes with the delicacy, facility and accuracy of the examination. If there is voluntary or reflex contraction of the abdominal muscles, she should be told to open her mouth and take deep inspirations and expirations, when, during the latter, her muscles will be found perfectly relaxed. To render the examination less fatiguing to the operator, the woman should be placed close to the edge of the bed, which should be as high as possible.

[1] See *Am. Jour. of Obst.*, 1879, page 490, *et seq.*

[2] The Operation of Turning by External Manipulation: *N. Y. Jour. of Med.*, Nov., 1859.

A.—Inspection.

By regarding the size and shape of the abdomen, a somewhat practised eye can form an approximate estimate of the probable stage of pregnancy, and, perhaps, also, of the position (not presentation) of the fœtus in utero; for, as a rule, we find the abdomen in longitudinal positions to be long, narrow and oval, whereas, in transverse positions, it is broad and more distended at its base, and less so above the umbilicus, which latter peculiarity might also lead to the diagnosis of twins, especially with a longitudinal furrow in the median line, and each half of the abdomen equally distended. This longitudinal furrow may be simulated by a distended bladder or arise from a peculiar formation of the fundus uteri (uterus arcuatus), and is, therefore, of but little value in the diagnosis of the fœtal position or plurality.

The skin of the abdomen generally shows numerous red or white shiny lines or striæ, which arise from its distention during pregnancy, and are owing to the rupture of the deeper layer of the epidermis, the rete mucosum, the red striæ being of recent origin and occurring principally with primigravidæ, the white marks being evidences of former pregnancy and having already undergone the process of cicatrization.

These lacerations of the rete Malpighii could, of course, only indicate a first pregnancy, as the old cicatrices do not disappear; but the fact of their being frequently seen in cases of distention of the skin by tumors, ascites, or even obesity, and on the nates, thighs, breasts, and in males, and their being not unfrequently wanting, even in multigravidæ, makes them of but secondary importance in the diagnosis of pregnancy.

The linea alba ordinarily assumes a dark color during the first pregnancy, especially in brunettes, and retains this pigmentation generally in after life, so that it can be considered a diagnostic sign only with the first child.

The umbilicus becomes gradually flatter and less depressed during the last five months of gestation, and occasionally, even, protrudes above the surrounding skin, without, however, being at all characteristic of pregnancy, inasmuch as any considerable distention of the abdomen may produce the same result.

Should the abdominal walls not be too thick or rigid, we can often see sudden protrusions of certain parts, and rapid twitchings over the abdominal surface, arising from the motions of the child and its close contiguity to the intra-uterine surface. I have repeatedly observed the fœtal head in breech or transverse presentations distinctly recognizable by sight through the thin abdominal and uterine walls, and the smaller parts, arms and legs, can be recognized at times in almost every case. It must be borne in mind, however, for the avoidance of error, that such movements may be simulated, even at will, by contractions of the abdominal muscles and the peristaltic motions of the intestines.

Bandl first pointed out a phenomenon recognizable by inspection of the abdomen during labor only, which is of considerable practical importance.

He found that in those cases where there exists an abnormal obstacle to the expulsion of the child, such as contracted pelvis, malpositions, etc., a distinct transverse furrow appears on the abdomen, about midway between the umbilicus and pubes, just at the junction of the cervix and body of the uterus, which is produced by the wedging of the cervix into the brim of the pelvis by the presenting part, and the concomitant fruitless concentric contractions of the uterine body. Occurring only in abnormal labors, it affords a valuable indication for the necessity of operative interference to prevent probable uterine rupture, Bandl first witnessing this sign after such an accident. I have seen this furrow in several cases where there was excessive pelvic obliquity and consequent anteversion of the uterus, a condition simulating, in its influence on the progress of labor, the minor degrees of contracted pelvis.

B.—Palpation.

The physician may stand on either side of the patient, at about the level of the umbilicus, and, having warmed his hands, should place them on her

Fig. 163.

Position of Hands in Palpation of the Abdomen.—(*Mundé*).

bare abdomen, gently and firmly pressing the *palmar surfaces* of all the fingers of both hands into the parietes, and gradually moving them about over the whole surface with slight pressing, pawing motion, keeping them sometimes together, at others separated, now examining one spot and then endeavoring to bring the uterus between the two hands; first determining the condition of the abdominal walls (1), by pinching up a fold of integument; then ascertaining the approximate period of gestation (2), by determining the height of the fundus and the general size and condition of the

abdomen; then seeking the distinctive fœtal parts (3), the presenting part and the position (4), the life (5), approximate size and degree of mobility of the fœtus (6), plural pregnancy (7), and any abnormal conditions (8) which may be present.

With a little practice, one can always determine the presentation; to be certain of the position in *all* cases requires much practice and dexterity, favorable conditions of the abdominal walls and a knowledge of the normal or abnormal positions which the fœtus may assume in utero.

1.—*The Condition of the Abdominal Wall: Obstacles to Palpation.*

The tension and firmness of the abdominal wall usually found in primigravidæ does not necessarily diminish with the increasing number of pregnancies, though it is undoubtedly more common to find the abdominal and uterine parietes the more flabby, pendulous and impressible, the greater the number of children. During the first four months, the uterine walls are firm and tense; with the increase of the liquor amnii, however, they become thinner, more impressible and pliant, until the filling out of the uterine cavity by the growth of the child, and its consequent diminished mobility, again renders them less yielding to the touch. Unusual tension of the abdominal walls or uterus, when the result of muscular action, may usually be overcome by the precautions mentioned under *Position*, and by unusual delicacy and care in the manipulations. An excess of *adipose tissue* is one of the greatest obstacles to successful palpation. In *hydramnios*, when marked, the hand can make but little impression on the elastic distended abdominal walls, and the only information of the presence of a fœtus will be imparted by the occasional thump of one of the larger parts against the hand, particularly if the presenting part be pushed up per vaginam. In slight degrees of distention, the fœtus is extremely movable, ballottement is usually distinct, and fluctuation may be felt.

Ascites and *flatus* will rarely interfere seriously with palpation, except by increasing abdominal tension.

The presence of urine in the bladder prevents the proper examination of the superior strait, both by the resistance it offers to the palpating fingers and the pain induced by their pressure.

Unusual tenderness of the abdomen is generally only partial, in spots, where the constant kicking of the child has produced a feeling of soreness, or where the fœtal head presses firmly against one or the other inguinal region. This abnormal sensitiveness is rarely sufficient to preclude careful palpation, though there are instances of general hyperæsthesia of the peritoneal covering of the uterus which renders palpation unbearable.

2.—*Determination of the Approximate Period of Gestation.*

The height of the fundus uteri above the pubis is a reliable objective symptom of the period of pregnancy in normal presentations, where the uterus contains only one fœtus. It does not hold good when the fœtus occu-

ies a transverse position, nor always in case of twins, nor in contraction of the pelvic brim, nor in case of fullness of the bladder or rectum, deformities of the vertebral column or thorax, tumors or hydramnios.

The height of the fundus is ascertained by slowly passing the tips of the fingers toward the upper part of the abdomen until they can be pressed in more or less deeply toward the spinal column, when the fundus can usually be grasped and felt as a rounded, firm, convex surface. The distance from the fundus to the pubis can then easily be measured by finger breadths, or, more exactly and preferably, by the pelvimeter.

Ordinarily, the uterus is not palpable until toward the end of the fourth lunar month, when it may be felt about midway between the pubis and umbilicus as a round, elastic body with a tolerably even surface. Ballottement may occasionally be felt.

20*th Week.*—The fundus is about one finger's breadth below the umbilicus, generally slightly to the right of the median line; in lean persons, the voluntary motions and several parts of the fœtus can frequently be detected by the hand, and ballottement is not unfrequently felt. Average height of fundus above pubis, 19 cm.; breadth of uterus, 14 cm.

24*th Week.*—Fundus one finger's breadth above umbilicus. Fœtal parts more distinct. Ballottement usual. Presentation can ordinarily be made out without much difficulty. Average height of fundus above pubes 19 cm.; breadth of uterus 15.5 cm.

28*th Week.*—Fundus three fingers' breadth above umbilicus, distinctly inclining toward the right side. Umbilicus flat. Average height of fundus above pubes 20.1 cm.; breadth of uterus 16.8 cm.

32*d Week.*—Fundus midway between umbilicus and ensiform process. Umbilical fossa entirely obliterated. Average height of fundus above pubes 22 cm.; breadth of uterus 18.3 cm. In primigravidæ the head is in the median line; in multiparæ it is often found slightly to one side.

36*th Week.*—Fundus immediately below ensiform process. Umbilicus protrudes. Average height of fundus above pubis 24 cm.; breadth of uterus 19.8 cm. The fœtus closely touches the uterine walls; the surface of the uterus is, consequently, less impressible. That part of the uterus and abdomen in which the breech lies generally protrudes, thus destroying the spherical shape of the fundus.

40*th Week.*—During the last month the uterus still increases in size, and, not being able to extend any higher in a vertical direction, expands laterally under the false ribs; the integument of the præcordial region is then often so tight as to prevent the palpation of the fundus. During the last two weeks the lower segment of the uterus, and with it the presenting part, descend often quite suddenly into the superior strait of the pelvis and become more or less fixed there; consequently, the fundus leaves the præcordial region and becomes palpable again about midway between the umbilicus and the ensiform process, generally slightly higher than it was at the end of the eighth month; it has fallen forward in its descent, and the change in the

appearance of the abdomen is very perceptible, especially when the patient is standing.

3.—*Determination of the Fœtal Parts.*

Before we can proceed to make a diagnosis of the presentation and position, we must learn to know the sensations imparted to the hand by the various parts of the fœtus.

The *head*, when not engaged, is felt as a round, hard, exceedingly movable body, often giving the rebounding sensation called ballottement, obtained by making a slight, quick depression, more a shove than a blow, of the abdominal wall in relation to the head. More or less of a depression may also be felt at the situation of the neck, the existence of the back and head not being continuous as it is at the breech.

The *breech* is a larger, softer, more irregular, less movable tumor, its resistance being continuous with that of the back. Its rebound is always much slower and less vivid than that of the head, it never giving the sensation of ballottement. Moreover, it is often accompanied by the small parts, knees or feet.

The *back*, being the continuation of the breech, is detected, in dorso-anterior positions, by the uninterrupted, regular resistance offered to the palpating fingers. "The sensation perceived is not always the same; generally the back of the fœtus is exactly applied against the uterine wall and this against the abdominal wall, in which case the plane of resistance seems quite superficial; at other times there exists between the back and uterine wall a certain quantity of liquor amnii, the resisting plane being then deeper, the fingers having to displace the intervening fluid."[1]

When the back is posterior, we cannot distinguish it so easily; the plane of resistance is narrower and situated laterally; the small parts are more easily felt. Often, to find the area of resistance offered by the back or side of the child, we must palpate opposite portions of the abdominal wall at the same time, so that we may differentiate the sensation of fœtal resistance from that of the elastic liquor amnii. This manœuvre is also necessary to determine plural fœtation or the presence of myomata.

The *arms* are not usually palpable, being small and kept flexed upon the thorax.

The *feet* and *legs* are recognized as very movable, often sharply projecting, small, irregular bodies, which are easily pushed about, and frequently retaliate by striking sharp taps against the examining hand.

4.—*Determination of the Presenting Part and Position.*

To properly examine the cavity of the pelvis at the superior strait, the hands should be placed with the ulnar edge downward on each of the inguinal regions, just above Poupart's ligaments, and the finger tips pressed downward and toward the median line. When this is properly done, one

[1] Pinard, *loc cit.*, p. 20.

of two sensations will be perceived—either the fingers come in contact with a hard, round body, which fills the pelvic cavity—the head—or only the resistance of the maternal soft parts is felt, the excavation being empty. No other conditions can be found until after labor has begun, for no other fœtal part than the head, vertex presenting, ever descends into the pelvic cavity until forced down by strong uterine contractions; further, the vertex once engaged never becomes displaced, the position sometimes changing, but the presentation never. Supposing the vertex to have descended well into the pelvic cavity, we can, by careful palpation, always show that the head is more accessible and more prominent on one side than on the other, the fingers of one hand being arrested sooner than those of its opposite, which sink more deeply and more toward the middle line, this being well shown in Figure 165. When the engagement is less pronounced, and the head less perfectly flexed, the difference between the sides is still perceptible. The brow is always that part of the cephalic sphere which is the more accessible,

Fig. 164.

Position of the Hands at the beginning of the Examination of the Pelvic Excavation.
(*After Pinard.*)

prominent and elevated; it also seems harder than the occiput, which, of course, is that which we feel upon the opposite side. The determination of this single point establishes the diagnosis of the presentation and position, which we can corroborate by determining the situation of the breech and back.

Thus, in a presentation of the vertex, with the cephalic tumor more prominent to the right and the resistance of the back felt to the left, the position is left, and *vice versa*.

When we do not find the vertex engaged in the cavity of the pelvis, we find either a breech or head just above the plane of the superior strait, or in one of the iliac fossæ; Pinard, in all the large number of women which he has examined, only having found two instances where both fœtal extremities corresponded with the maternal flanks. Both extremities being found

generally easily, for one always lies at the opposite end of the diameter, passing through the other, we should determine whether the head is above or below, the differential points between head and breech having been given above. The discovery of the back, then, completes the diagnosis of the position.

In presentations of the face, with the back anterior, a hard, round tumor is felt above the brim, a little to one side, and the resistance of the back felt deeply on the same side, a marked depression being found between the head and back; with the back posterior, we also find the accessible portion of the head and the resistance upon the same side. Palpation in these conditions is often not as satisfactory as examination per vaginam.

5.—*Determination of the Life or Death of the Fœtus.*

The spontaneous movements of the fœtus are easily detected by the examining hand, and serve to indicate the undoubted presence and life of

FIG. 165.

The Hands Exploring the Excavation—the right hand arrested by the brow on the right side. (*After Pinard.*)

the child. They are rarely felt or observed before the twentieth week, and are of two kinds; a slow, rolling, gliding motion, proceeding from the whole child, and quick, sharp taps which result from the action of its upper or lower extremities.

If the child is strong and healthy, its motions will generally be quick and active, provided the amount of liquor amnii permits sufficient freedom; if the amniotic fluid is excessive in quantity, the fœtal movements will be rapid, but weak and flighty, the size of the fœtus and the amount of liquor amnii being, as a rule, in inverse proportion.

The voluntary motions of the child are not always felt, because, in some cases, the uterus encloses its contents too firmly, and there is too little fluid

present, in others, the fœtus is weak, sickly and incapable of active existence; some mothers, however, never feel quickening during their whole pregnancy, and still the children are born strong and healthy.

The spontaneous movements of the fœtus are frequently excited or increased by the irritation of the examination, and especially by the application of a cold hand to the abdomen, not in consequence of the direct transmission of the cold itself to the fœtus, but through reflex action from the abdominal integument to the abdominal muscles, which contract and press on the uterus, which, in its turn, contracts and thereby incommodes the fœtus, causing it to protest with hands and feet against the disturbance and to rapidly change its position. I have witnessed this phenomena hundreds of times, where students, forgetting the rule to warm their hands before examining, proceeded to palpate the abdomen, producing thus, not only slight shock to the mother, but also contractions of the uterus, thereby interfering with the examination.

The *death of the fœtus* is not recognizable with certainty, but may be strongly suspected if the palpating hand discovers an unusual flabbiness and compressibility of the abdomen in contrast to its former firm and elastic feel, if the motions of the child are not distinguishable, if its body remain passively in any spot to which it is pushed, and thus gives the impression of an inanimate body, if its head feel unusually soft and flaccid (not reliable), and lastly, if, with all these signs, the fœtal heart sounds are inaudible.

6.—*Determination of the Approximate Size of the Fœtal Head.*

In cases where the parturient canal is more or less contracted by deformity of the bony pelvis, disease of the cervix (carcinoma), uterine tumors (fibroids), or where there is habitual excessive development of the child at term, it is of great importance to have at least a fair idea of the size and compressibility of the fœtal head, and this can be gained by careful and practiced palpation, together with vaginal exploration and a comparison of the general dimensions of the child.

Ahlfeld[1] and Sutugin[2] have shown that the length of the uterine axis of the fœtus is equal to about half the length of its whole body, and that its actual length can be easily and pretty accurately obtained by doubling the length of the body of the uterus; ascertained by placing one pole of a Baudelocque's pelvimeter against the presenting part of the uterus in the vagina, and the other against the fundus; in transverse positions, the branches of the pelvimeter are placed transversely against the breech and head of the fœtus in utero.

Ahlfeld found, in 250 cases, that the child in the 36th week averaged 48.3 cm. in length, and weighed (computed by analogy) about 2.806 gms.; in the 37th week, 48.3 cm. and 2.878 gms.; in the 38th week, 49.9 cm. and 3.016 gms.; in the 39th week, 50.6 cm. and 3.321 gm.; in the 40th week,

[1] *Arch. fur Gynäkologie*, Band, II, Heft 3, 1871. Bestimmungen der Grösse und des Alters der Frucht.

[2] On the Means of Ascertaining the Length of Gestation by Measurements of the Fœtus and Gravid Uterus during the Second Period of Pregnancy. Trans. London Obst. Soc.: *Obst. Jour. of Great Britain*, Sept., 1875.

50.5 cm. and 3.168 gm. By these means and by careful palpation, we can reach an *approximate* idea of the size of the fœtus; more than this, it is almost impossible to obtain.

7.—*Determination of Plural Pregnancy.*

The diagnosis of the presence of twins can be made with absolute certainty only when two identical parts are found to be present, *i. e.*, when a second head or breech is felt. Occasionally it is possible to define the bodies of the two fœtuses more or less clearly by palpation, and at times the great mobility of the parts palpable through the abdominal walls, when the presenting part is felt to be fixed in the pelvic cavity, may lead us to suspect and detect the presence of twins. In general, the size and shape of the abdomen, the longitudinal furrow in the median line, the seeming multiplicity of small members, the exceeding active, ubiquitous motions of the child, the sensations of the mother, the localized œdema over the pubis, spoken of by Pinard, even the hearing of the fœtal heart sounds at different parts of the abdomen, are all uncertain and treacherous signs, compared with the detection of two identical parts.

Pinard[1] lays especial value on *the permanent tension of the uterine wall* perceived on palpation. The sensation, difficult to accurately describe, is readily appreciated by one accustomed to this method of examination. "Instead of depressing the uterine wall with facility, one perceives that this wall is tense and resisting, the sensation being analogous to that perceived by depressing the wall of a rubber bag distended with fluid or air. It is not that soft, doughy sensation, which is perceived upon depressing the relaxed uterine wall when the organ is normally filled; neither is it that hard sensation, almost ligneous in character, which is felt upon depressing the uterine wall during a contraction; it is a sensation similar to that perceived upon depressing the wall of a distended cyst. I lay stress upon the point that this permanent tension of the uterine wall is met with in two classes of cases only, viz.: multiple pregnancy and hydramnios."

Of the numerous cases of twins which I have seen, either under my own care or in various hospitals, only a small minority have been detected before the birth of the first child, in spite of the customary external and internal examinations. That the recognition of three or more fœtuses in utero is possible only under exceptional and favorable circumstances is evident, the only case reported, so far as I am aware, where the diagnosis of triplets was made by palpation, being that recorded by Pinard.[2]

8.—*Determination of Abnormal Conditions.*

Hydrocephalus may occasionally be diagnosticated by palpation, if the head is found to be unusually large, comparatively soft, and even faintly fluctuating, and if, in a normal pelvis, it remains above the brim in spite of energetic uterine contractions.

[1] *Loc. cit.* page 46. [2] *Loc. cit.* page 49.

I have diagnosed the presence of a *hydatiform mole*, chiefly by the enormous development of the uterine cavity disproportionate to the supposed period of pregnancy, the entire absence of all solid parts or resistance usually shown by the presence of a fœtus, the uterus seeming to contain only a jelly-like mass, with a semi-doughy elasticity.[1] Pinard[2] has made a similar observation, and states that he did not find the rounded elevations, or the superficial or deep furrows mentioned by various authors.

Abdominal tumors, fibroids, cysts, etc., are usually accessible only to palpation, and may be recognized by the irregularity which they impart to the general outline of the uterus or abdomen. The flaccidity of the abdominal parietes after delivery will frequently permit the palpating hand to detect abnormalities and tumors of which no previous suspicion was entertained.

In rupture of the uterus palpation gives us the most positive information. If the laceration is extensive the child usually escapes into the abdominal cavity, either partly or wholly, the uterus contracts and occupies the side of the abdominal cavity opposite that containing the fœtus, which is then felt with much greater distinctness than when still in the uterus, its body and limbs in these subjects appearing as though covered only by the skin. "When the fœtus does not thus escape, the fundus uteri commonly falls to the opposite side to that in which the rupture has taken place, owing to the local paralysis of the latter."[3] Later the uterus becomes more relaxed, and blood and liquor amnii may collect in and distend the dependent portions of the peritoneal cavity. Hecker says that these blood tumors may appear in the hypogastric or inguinal region, or in the vagina.

Tully[4] and Parry[5] have each reported a case where a gelatinous fluctuating tumor, found on autopsy to be a subperitoneal hæmatoma, appeared just above the pubes, its significance not being recognized until the necropsy, when the uterine rupture was found. The importance of this symptom, as indicating the occurrence of a possibly, as yet, slight uterine perforation, is obvious, and its proper appreciation may enable us to diminish the mortality from this accident.

A uterus arcuatus, in moderate degree, produces, during the contractions of the organ, a slight concavity of the fundus, with a corresponding prominence of the cornua. Knowing the various forms of dystocia which are liable to happen in exaggerated forms of this deformity, the detection of its presence is not without practical value.

C.—Percussion.

Through this we can ascertain the degree of distention of the bladder, which certainly is of importance, both during examination and labor, as well as in the puerperal state, and is a prominent symptom; indeed, the only external one, in retroversion or flexion of the gravid uterus; as, also, the presence of fæces in the colon. Should the thickness of the abdominal walls or their rigidity prevent successful palpation, we can detect the boundary

[1] *Amer. Jour. of Obst.*, Vol. vii, 1874-5, page 475.
[2] *Loc. cit.* page 52.
[3] Chadwick, *Boston Med. and Surg. Jour.*, Aug., 1872.
[4] *Amer. Jour. of Obst.*, May, 1869.
[5] *Amer. Jour. of Obst.*, Aug., 1873.

of the uterus and the height of the fundus through percussion, a knowledge which can occasionally be acquired as early as the fourth month of pregnancy, especially with an empty bladder and an anteverted uterus. In these respects, percussion is not to be undervalued, otherwise it is of but little practical value.

While it is hardly possible to explain every minute technicality of external examination, the above description is sufficiently explicit to enable any one, with practice and a little care, to examine a pregnant woman by this method, with a fair prospect of making an accurate diagnosis. One point must be remembered, and that is, that no force need be employed in any part of the examination, and that the woman should be subjected to no real discomfort or pain; indeed, forcible or rough manipulation will, in itself, frustrate the object of the procedure by exciting reflex contractions of the abdominal and uterine muscles, and thus withdrawing the fœtus from the touch of the examiner.

It has been said that patients in the higher walks of life will not submit to this method of examination, on the ground of its being an improper and unnecessary exposure of the person; but I do not think that any woman who has sufficient confidence in a physician to entrust to him her life during confinement, will object to his palpating and auscultating her abdomen after submitting to a vaginal examination, when she is told that the one method of examination is as necessary as the other, for the safety of herself and child during the coming ordeal. I have never had a patient refuse when the necessity and value of the examination had been explained to her. I think, further, that, if our patients were once initiated into the benefits of this practice, and the very slight inconvenience occasioned them by it, and if our physicians would make it a rule to insist upon it in every case, it would soon become a universal custom, as much desired by patient as by physician. How many mal-presentations could thus be detected and corrected, how many dangers averted, how many women forewarned! Scarcely one of us but has met with obstetric cases in which a previous examination, before labor, would have enabled him to remedy a difficulty or prepare for an unforeseen accident.

II.—TREATMENT.

The various purposes for which external manipulations are employed in the treatment of obstetric cases are: The rectification of an existing malposition, or the conversion of one presentation into another more desirable—external version; the expression of the fœtus; the expression of the placenta. These manipulations differ chiefly from those employed for a diagnostic object, in being useful or practicable only during the various stages of labor. To convert a transverse into a longitudinal position several months or weeks before labor is possible, but useless, because of the great mobility of the child, the probability of a spontaneous return of the abnormal position, and the chance the child has of spontaneously assuming a normal presentation.

A.—Version.

External version is, essentially, an operation advisable and beneficial only just before or during the first stage of labor, before the discharge of the liquor amnii. To insure its easy performance the utero-abdominal walls should be lax, the fœtal position readily palpable, the liquor amnii present, and the fœtus easily movable. Still the operation has occasionally succeeded after the rupture of the membranes, and should always be attempted when the uterine walls are lax. The size of the child will materially influence the practicability of this manœuvre, which, of course, will more easily succeed with a small than a large child. But the child must be living and possess the requisite amount of elastic resistance; if dead, it is easier to turn a large than a small child.

The paramount advantage of version by external manipulation is the avoidance of the always more or less hazardous passage of the whole hand into the uterus, thus avoiding the possible injury to the endometrium, or the introduction of septic matter into the uterine cavity. Another, scarcely less important, is the conversion of the malposition into a *vertex* presentation, internal version being generally necessarily podalic; thus not only the safety of the mother, but that of the child also, is increased by external version.

As by internal manipulation, so may the position be changed by external version to a head or breech.

Indications.—Whenever, during the last month of gestation, or during labor, before the rupture of the membranes and fixation of the presenting part, examination reveals a transverse position of the fœtus, the attempt should be made to convert it into one of the head by external manipulation. Should palpation show that, even after the discharge of the liquor amnii, the child is but loosely grasped by the uterine walls, a like endeavor should be made. The trial can do no possible damage if carefully employed, and may succeed even hours after the evacuation of the waters. During gestation the measure will usually be futile, the fœtus often resuming its abnormal position; in that case it should be repeated and particular directions left by the physician that he be sent for at the first sign of labor.

Following in the lead of Mattei and Hegar, Pinard has recommended the conversion of every breech into a head presentation, by external version. Although this view is not shared by the majority of writers, it is, in my opinion, unquestionably good practice to endeavor to avoid the anxiety to mother and physician, and the danger to the child, always accompanying a presentation of the inferior extremity whenever the presentation is discovered so early in labor that its conversion into a cephalic presentation is practicable. That it is likely to be rather more difficult than in a transverse position, should not deter us from making the attempt. Those cases in which the head, in transverse positions, shows a spontaneous tendency to glide toward the pelvic brim; oblique positions; or where the presenting breech rests on the

ilio-pectineal line; or the feet present instead of the breech; or where there is an abundance of liquor amnii, will prove specially favorable for external version, as is also the case with a second twin child. Cases of moderately contracted pelvis form an exception to the rule of cephalic version. In these cases it is generally safer to turn by the breech or feet, as it has been shown that an after-coming head, being shaped like a wedge, will usually pass through a narrow pelvis more readily than the broad vertex of a presenting head.

Contra-Indications.—The only actual contra-indication to the *attempt* of external version is the necessity for a rapid termination of the labor, or the presence of twins in utero. In this latter case, there would be danger that the pressure would rupture the membranes if the sacs were distended, or alter the relation of the fœtal annexes, particularly of the umbilical cords. Tenderness, thickness, or tension of the abdominal walls, the small amount of the liquor amnii, fixation of the presenting part, unusual size or death of the child, are not properly contra-indications to the *attempt*, but rather obstacles to the *success* of the operation, which *may* occasionally be overcome.

Operation.—An accurate knowledge of the exact position of the child is absolutely indispensable to the rational performance of external version. This knowledge can only be acquired by palpation and auscultation, as before described. As already stated, the operation may be performed at any time during the last month of pregnancy, and during labor, so long as the child is not too firmly grasped by the uterine walls, but the time of election for the operation is during the first stage of labor, before the membranes have ruptured, and when the os uteri is approaching complete dilatation.

The position of the child having been ascertained, version is performed as follows: The woman is placed in the position employed for palpation (see p. 1099), with empty bladder and rectum, the physician standing at her side, preferably that toward which the breech is turned, and placing one open hand on the abdomen over the head of the child, the other over the breech, grasps them gently but firmly, and endeavors, by a sliding, pushing motion, to direct them toward the desired point, the head downward the breech upward. In doing so, he will usually be obliged to press deeply into the abdomino-uterine wall, and, as it were, push it in the desired direction. Thus, with the head to the left, the operator stands on the right side of the patient, places his right hand over the head of the fœtus his left over the breech, and while he pushes the breech up toward the fundus, presses the head down into the pelvic brim.

If labor have already commenced, of course this is done only between the pains, during which the hands hold the two fœtal antipodes firmly fixed in whatever position they may have been placed. The pains themselves, by

ting the uterine walls around the child, aid in correcting and fixing ition, when once rectification has begun.

e manipulations must be continued until either the purpose is obtained, impossibility demonstrated. Occasionally an attempt made at one fails, and after an interval succeeds, or failing at first we may be suc- where the patient has been anæsthetized to the point of muscular tion.

ender fœtal evolution possible when one extremity has engaged in the brim, we have to raise it from the cavity by pushing up the inferior segment, either with a hand above the pubes or with a finger or introduced into the vagina, and displacing it toward one of the sides pelvis; after this we proceed as before directed.

alic version by external manipulation is indicated only in cases where ld is very movable, and the os but very slightly dilated; such cases are,

Fig. 166.

n of the hands, and direction of the pressure in external version when the position is oblique. (*After Pinard.*)

larly, the early stages of placenta prævia, when it may be desirable or tive to use the thighs and breech of the child as a hæmostatic wedge. en the rectification of the position has been confirmed by a vaginal nation (during which the head is firmly held down by the hand of an nt), and the head is felt in the pelvic brim, the woman is directed to the side where the head formerly was, and a firm pillow may be applied ie ilio-lumbar region of that side, to prevent the head from again slip- nto the iliac fossa. Pinard recommends a peculiarly-padded abdom- ndage for this purpose, he rectifying the position as early as the eighth , and at once applying this "ceinture," which is allowed to remain the head is fixed, the pressure by it being gradually increased. It no inconvenience, and is said to be efficient.

rtainly have found cushions and pillows ineffectual, unless the proper

lateral decubitus was employed at the same time, and even then the head has often required to be pushed down repeatedly and held before its fixation could be assured. Ellinger doubtless gives the most effectual mode of keeping the head down, when he insists on its being held by the hand of an assistant until the uterine contractions force it into the pelvic brim, or the membranes rupture, or the os is sufficiently dilated to allow of their being ruptured; such an assistant can be found in any intelligent person, all that is required being to exert steady downward pressure over the hypogastric region.

When the os is sufficiently dilated, that is at least one-half, the best means of fixing the head permanently is to rupture the membranes. Until the head has become firmly engaged in the pelvic cavity, the woman should occupy the lateral decubitus on the side where the head formerly was. Occasionally, in cases of extreme mobility of the fœtus, and in oblique positions, the same lateral decubitus may succeed alone in restoring the longitudinal position of

FIG. 167.

Position of the hands, and direction of the pressure in external version when the position is longitudinal. (*After Pinard.*)

the child. To avoid possible prolapse of the funis, the membranes should be ruptured during the interval between the pains, the head being fixed by exciting uterine contractions by circular friction of the fundus combined with steady downward pressure.

Schatz's method of converting a face into a vertex presentation is already briefly described on page 347. It should be undertaken before the rupture of the membranes, while the face is still at the brim. To be successful, the operator must be proficient in external obstetric examination, and be able to diagnose easily and positively the exact position of the child. One great advantage of the method is, that if it fails, it can at least do no damage.

B.—FŒTAL EXPRESSION.

From time immemorial, friction of the abdominal parietes during tedious labor has been employed as a stimulant to the regular uterine contractions,

and has proved itself a safe and efficient auxiliary, more prompt than medicinal oxytocics, and more effective than the hot bath, cold sponging, or active motion. It is a practice familiar to every nurse or midwife, and probably made use of to a greater or less degree in the majority of labors. By exciting or increasing uterine contractions, the normal expulsive force of the uterus is increased, and abdominal friction, therefore, must be considered merely as an oxytocic, a promoter of the natural expulsive power of the uterus. *Expression* of a whole or part of the fœtus is, however, a totally different thing. Employed by the obstetricians of the middle ages, it had fallen into oblivion until Von Ritgen,[1] of Giessen, in 1856, recalled it to the profession. It was not employed, however, until 1867, when Kristeller, of Berlin,[2] in a thorough and explicit paper, reported a series of cases in which, by systematic rhythmical pressure on the fundus uteri, he had succeeded in effecting the delivery of the child. Since this time it has been recommended and adopted by many eminent authorities,[3] among whom are Ploss, Abegg, Playfair, Schroeder, Barnes, Spiegelberg, and Bidder.

The most important *indications* for the use of the method are: to reinforce weak or deficient uterine contractions; to aid in the expulsion of the after-coming head; to aid the delivery of the head in forceps cases. Other indications have been given by its authors, who have endeavored to extend its use to cases where its success would be a rare exception.

1. *To Reinforce Weak or Deficient Labor Pains.*

Indispensable conditions to the success of expression are: a vertical position of the child; the absence of any inflammatory affection or unusual tenderness of the abdomen; a normally shaped pelvic canal; a well dilated os uteri, a ruptured bag of waters, and, finally, a low position of the presenting part. Partial dilatation of the os and the persistence of the membranes will not absolutely contra-indicate the operation, though, to be effectual in such cases, it would have to be continued so long as to become exceedingly painful to the patient, and exhausting to the operator.

That steady pressure on the fundus uteri will, when the os is thoroughly dilated, advance the presenting part towards the floor and outlet of the pelvis, can readily be demonstrated in any suitable case; to be sure, the presenting part recedes when the pressure ceases, but with each succeeding pressure the advance will be slightly greater, until, everything being favorable, the vulva is distended and the part expelled.

The cases particularly suitable to Kristeller's method are those so frequently met with in primiparæ, in which the presenting part rests on the floor of the pelvis, or even presses against the perinæum, and for want of efficient pains, does not advance, or advances but to recede again, until, after several hours of delay, exhaustion demands relief.

In breech presentations, I believe the method to be vastly more valuable

[1] "Ueber das Entbinden durch Druck, statt Zug." *Monatsschr. f. Geb.*, 8, 1856.

[2] *Berl. Klin. Wochenschr.*, No. 6, 1867 and *Mon. f. Geb.*, 29.

[3] See *Am. Jour. of Obstet.*, 1880, page 352.

extension of the head until the face slips over the fourchette. This manœuvre may occupy fifteen minutes or longer, and beginners are particularly cautioned not to hasten the process, and to exert only the very gentlest traction on the chin with the intra-rectal fingers, while supporting and even repelling the occiput with the other hand, until the perineum is thoroughly distended.

After what has been said in the previous section, it is evident that suprapubic pressure in the rare cases of forceps extraction of an after-coming head is of even greater importance than in the case of the presenting head, the compression, of course, being simultaneous with the traction.

IV.

ANÆSTHETICS.

THE general uses, indications and contra-indications, etc., for anæsthesia[1] having been already discussed in so far as the two agents—chloroform and ether—most generally used are concerned, it is only necessary here to speak of those which have been employed more recently in obstetric practice. Of these, the most important are ethylic bromide, methylene bichloride, nitrogen monoxide, and various combinations of two or more anæsthetic substances.

Ethylic Bromide (C_2H_5Br), discovered in 1827 by Serullas, is a limpid, exceedingly volatile, neutral liquid, having a strong, not unpleasant ethereal odor, a disagreeable, sweetish taste, boiling at 105.25° F., not easily inflammable, sparingly soluble in water, but miscible in all proportions with ether or alcohol.

It is not a thoroughly stable compound, and unless great care is observed in its preparation, or if it is not freshly made, is apt to be contaminated with dangerous impurities[2] (C_2Br_4 and Br), which may impart to it a slight brown coloration and a certain pungency of odor, together with a greatly increased liability to the production of dangerous toxic effects. It is, therefore, necessary to use a product which is fresh and which, in addition to the usual means of rectification with water, potash, and calcium chloride, has been treated with five per cent. of olive oil, shaken occasionally for twenty-four hours and then distilled over a water-bath at a temperature below 104° F., the distillate being pure ethyl bromide.[3] It was, I believe, first used as an anæsthetic on man by Turnbull, of Philadelphia (1878), and soon after by Levis of the same city.

It is an exceedingly pleasant anæsthetic, producing entire muscular relaxation in two or three minutes, when given freely at first, as it should be, on

[1] See page 915, *et seq.*

[2] Junck: *Med. Record*, July 11th, 1880, p. 84.

[3] *Le Prog. Med.*, Aug. 28th, 1880.

account of its great volatility, and generally with very few disagreeable symptoms.

The pulse and respiration are at first slightly stimulated, but when the anæsthesia is complete, depressed. The face and neck are often flushed, there is apt to be a hypersecretion of mucus in the fauces. Vomiting is not observed as often as after the use of chloroform. The symptoms in general are those observed after the use of most ethereal anæsthetics.

At least two deaths from its use have been reported, in which the drug has killed by its toxic action on the respiratory and cardiac centres, and several cases are known where it has produced symptoms of irritant poisoning, doubtless from its contained impurities.

Lyman[1], in a series of sphygmographic tracings, has shown in an impressive manner the depressing action of the drug on the heart of animals and of man, the pulse curve being less favorable than that of chloroform, and the manner in which death ensues in an animal from an overdose of the drug; in his experiments respiration and the heart's action ceasing simultaneously, these agreeing with the observations made on the human subject in the fatal cases recorded.

Montgomery,[2] of Philadelphia, has strongly advised the use of this agent as an anæsthetic in labor, saying, in a paper giving the results of its use in twenty-nine cases in his own practice, "The ethyl was administered with the advent of each pain, by holding over the face of the patient a napkin on which a few drops had been poured. This was removed as the pain subsided. There was no choking or suffocation, as with chloroform, and entire absence of the stage of excitement. After one inhalation, the patient invariably begged for it with the advent of each recurring pain. With small quantities, the sensation of pain was blunted, while intelligence was uninterrupted; the patient was perfectly subject to control and ready to render or withhold voluntary effort, as desired. Under such treatment, the expulsive efforts resembled those made to evacuate obstinately constipated bowels, and were not attended with more pain. In multiparæ, the usual expression was that they had never known such relief. No diminished power in the uterine contractions was observed subsequent to its use; in fact, in many of the cases where before the contractions had been ineffectual and irregular, they became strong and regular."

Montgomery gives also the conclusions of Lebert, Wiedemann, Haeckermann, Müller, Chisholme, and Prince, in all over seven hundred cases, they agreeing in the main with his conclusions, though Müller notes some unpleasant results which were doubtless caused by impurities in the ethyl.

Booth[3] and Byrd[4] strongly recommend mixtures of ethyl bromide with alcohol and chloroform; the first using alcohol two parts with chloroform and ethyl each one part; the second, ethyl one; chloroform three; alcohol four.

[1] Artificial Anæsthesia and Anæsthetics, N. Y., 1881, p. 216.
[2] *Am. Jour. of Obst.*, vol. xviii, 1885, p. 561 and p. 1217.
[3] *Thera. Gaz.*, 1885, p. 159.
[4] *Thera. Gaz.*, March, 1884.

While there is no doubt that the drug given as above described is exceedingly efficient, rapid and pleasant in its action, still, after weighing the evidence of both sides, I must agree with Lyman that ethyl bromide must be ranked with chloroform as one of the most potent and dangerous of anæsthetic substances.

In using the drug we must take special care that the specimen be pure and fresh, the bromic impurities with which it is liable to be contaminated being much more dangerous than the impurities which may exist in chloroform, and should give it only to partial anæsthesia; when it becomes necessary to produce complete muscular relaxation ether is much to be preferred.

Methylene Bichloride (CH_2Cl_2). This agent, at present employed very extensively in London, is a colorless, ethereal fluid, its odor much resembling that of chloroform, with which, indeed, unless very carefully prepared, it is apt to be largely contaminated. It is very volatile and inflammable, and its boiling point, 87° F., so low that it cannot conveniently be used in warm weather.

The blood during its administration remains of a bright red color and clots easily, even after its fibrin has been removed. The action of the heart and respiration are at first slightly stimulated, afterward depressed, its action being like that of chloroform. Anæsthesia is produced very rapidly and as rapidly recovered from, from one to two drachms being usually sufficient to induce complete insensibility. Though vomiting occurs quite often, the disagreeable effects observed both during and after the administration of methylene bichloride are usually much less marked than after the use of chloroform. Considering the relative number of cases in which the drug has been used, its rate of mortality[1] is higher than that of chloroform, death being produced, as by this agent, by heart failure.

Though fashionable at present in England, it is not likely that its popularity will stand the test of long experience, as it is difficult to procure pure, is inflammable, does not appear to be as safe as, and possesses no marked advantage over, chloroform. I do not think that it will supplant this drug or that its use is desirable.

Nitrous Oxide (N_2O) is a colorless gas, neutral in reaction, having a faint, sweetish odor and taste, reduced by a pressure of fifty atmospheres at 7°, or thirty at 0°C., to a faintly steel-blue colored, mobile liquid, which resumes the gaseous state when the pressure is removed. It is freely soluble in cold water or in alcohol, less soluble in warm water; is decomposed by a red heat, and though not combustible is, after oxygen, one of the best supporters of combustion known. It is best prepared by gradually heating pure ammonium nitrate to a temperature of 215° C., the gas formed being passed through wash-bottles containing sodium hydrate and ferrous sulphate. It is most conveniently kept condensed and liquefied in strong, portable metallic

[1] Eleven cases of death from the use of this drug have been collected by Lyman. *Loc. cit.*, p. 102.

cylinders, and can be procured thus from the dental supply manufacturers, together with the necessary conducting tubes and rubber gas bag.

When inhaled, diluted with air, it produces the exhilarating effects first observed by Davy in 1799, the anæsthetic effect of the pure gas being first noted by Wells, of Hartford, after whose death, in 1848, it was almost forgotten until Colton, in 1863, began to use it as a dental anæsthetic, and at this date (January, 1886) has administered the gas in over 148,000 cases without a single bad result, though others have not always been so fortunate, more than five deaths having been reported which may be attributed to the lethal action of the gas.

While, without doubt, it is by far the safest anæsthetic for operations requiring only a brief period of unconsciousness, it was long ago shown that in its pure state it soon produced asphyxia, and that when mixed with air its anæsthetic power was much lessened. Joylet and Blanche[1] showed that animals could live in an atmosphere of nitrous oxide and oxygen combined in the same proportions as in ordinary air, and later, Paul Bert demonstrated that anæsthesia with these mixed gases could be produced and indefinitely continued without harm. The following is from a paper read by him before the Academy of Sciences, November 11th, 1878: "The fact that nitrous oxide must be administered in a state of purity, shows that in order to impregnate the organism with a sufficient quantity, under the normal atmospheric tension, the gas must form one hundred per cent. of the air that is breathed. But if we suppose the patient placed in an apparatus where the pressure can be raised to two atmospheres (thus doubling the amount of gas in a given space), the necessary conditions will be secured by respiration of a mixture containing fifty per cent. each of nitrous oxide and common air. Under these conditions there should be manifested anæsthesia, while, as a consequence of the normal quantity of oxygen in the blood, all the natural factors of respiration are maintained." His experiments, first upon animals and later upon the human subject, were perfectly successful, he using the nitrous oxide diluted with fifteen to twenty per cent. of oxygen, and increasing the atmospheric pressure about one-fifth.

Bert's method, though safe and efficient, can never be generally used, as the apparatus required—a special chamber in which patient and operator remain in compressed air—is cumbersome and costly, and later experiments have shown that, at least in obstetric practice, increased pressure is not necessary.

Klikowitsch,[2] in 1880, strongly advocated a mixture of nitrous oxide four parts and air one part, as the ideal obstetric anæsthetic agent.

Winckel[3] has used the gas with success at the Dresden Maternity, employing a simple mouth-piece and not covering the nose.

Dœderlein[4] has used a mixture of nitrous oxide and oxygen at the Erlangen Obstetrical Clinic for over a year, with excellent results, the mixture of

[1] *Archiv de Physiol.*, 1873, p. 364.
[2] St. Petersb. *M. Wochenschr.*, 1880, p. 117, and p. 249.
[3] *Centr. für Gynäkol.*, No. 10, 1883.
[4] *Am. Jour. of Obstet.*, vol. xix, 1886, p. 100.

the two gases taking place in a large gas holder, from which it is conveyed to the parturient ward in pipes laid along the wall at the height of the beds. It is generally used only in the second stage, and though continuously inhaled for from thirty minutes to an hour, no cumulative effects or threatening symptoms were observed. The sensations during the narcosis, as described by Dœderlein, who had had the mixture repeatedly administered to himself, are not disagreeable. They consist first in a peculiar prickling feeling passing through the body, slight darkening before the eyes, and in a vivid mental activity, standing in marked contrast to the lethargic, somnolent state of the body, but especially in an anæsthesia which, at first incomplete, later becomes complete. In most parturients, ten to fifteen inhalations sufficed to quiet them, without any phase of excitation, and even to cause them to sleep. Usually there is no consciousness remaining, though the patients react to calls, that is to say, promptly answer questions. Restored to consciousness by a few breaths of ordinary air, most of them know nothing of what has happened. It is hardly possible to demonstrate that the narcosis has any effect on the frequency or force of the pains, or in any way retards the labor, the latter sometimes being even hastened by a very energetic bearing down. In operations in which a relaxation of the uterus is desirable the gas is not appropriate, because the pains continue strong. But in normal labors and such manipulations as do not require uterine relaxation this mixture is strongly recommended.

Could the mixture of nitrous oxide and oxygen, with the apparatus necessary for its use, be furnished in a cheap and easily portable form, it would undoubtedly become the favorite anæsthetic of the accoucheur, though until these questions can be satisfactorily answered, its use is, by necessity, practically confined to lying-in asylums and hospitals.

The superior advantages of any of the agents mentioned above over our old friends, chloral, chloroform, and ether, have not yet been conclusively shown, and until this becomes the case, I must still advise chloral for relieving the suffering in the first stage, chloroform for dulling the severity of the pain during the expulsive act, and chloroform or ether for any operation requiring complete anæsthesia.

When chloral has been used during the first stage and beginning of the second, should it become necessary to give any additional anæsthetic, ether is much to be preferred, as it stimulates the heart, and, unless pushed to a surgical degree, the uterine contractions.

V.

ANTISEPSIS IN OBSTETRICS.

WHEN, in 1847, Ignaz Philip Semmelweiss, then an interne in the Vienna Maternity Hospital, formulated, for the first time, the theory that puerperal fever was caused by the absorption of septic matter, and that it could be in a great measure prevented by destroying this morbific material, by the application of a disinfectant solution (*i. e.*, chlorine water or chloride of lime), his idea attracted little attention, and it was not till 1849 that it became more generally known. Rokitansky, Hebra and Skoda received the new doctrine kindly, but most of the authoritative minds of the day ranged themselves on the side of its enemies, and though Semmelweiss defended his theory with a pertinacity amounting almost to fanaticism, it gained little ground, and brought its author but little honor, though much of scorn and hatred.[1] Nevertheless, this idea was the germ from which our modern antiseptic midwifery has developed, though Pasteur had first to demonstrate that the active agent in the virus was a living organism—one of the microbes of decomposition—and Lister to show the results obtained by keeping it and its kindred from wound surfaces.

We need not trace the progress of antisepsis or of antiseptic procedures step by step; few there are now who doubt its value, and none who can gainsay the results obtained through its employment. Though it may be—and has been, in some instances—carried to excess, as later results have proved, properly used, it is a safeguard which none of us can now be without.

While, in the years before antiseptic measures were used, the mortality in even the best Maternities of Europe was enormous—often averaging 15 to 20 per cent. for long periods, and at times being even greater, so that, as is graphically described by Fritsch,[2] "To be laid on the bed of confinement was equal to being delivered to the hangman"—now the death-rate is reduced to less than one per cent. In the vast Maternity Hospital in Vienna, in 1883, the mortality was only one-half of one per cent. In the Prague Maternity[3] the mortality, in 1865, was 9.28 per cent.; in 1869, 11.62 per cent.; in 1871, 3.08 per cent. In 1875 new wards and antiseptic measures at once lowered the death-rate to 2.75 per cent.; in 1882 it was only 0.56 per cent., and in 1883, in Prof. Streng's division, in over eleven hundred confinements, there was no death from septic causes.[4] In 1870 Tarnier introduced the antiseptic system in the Paris Maternité, and events have proved that, with each successive step of advance in the minutiæ of its application, the death-rate has fallen.

[1] Ignaz Philip Semmelweiss. Herdegen.—*Am. Jour. of Obst.*, vol. xviii, p. 248.
[2] Grundzüge der Pathologie und Therapie des Wochenbetts. 1884, p. 34.
[3] Des Methodes Antiseptiques en Obstetriques. Paul Bar. Paris, 1883.
[4] The Science and Art of Midwifery. Lusk. New York, 1885, p. 689.

Prior to 1870 the mortality fluctuated from 3.5 per cent. in 1858, 11.7 per cent. in 1861, 13.7 per cent. in 1863, 20.3 per cent. in 1864 to 11.6 per cent. in 1869. In 1871 it fell to 2.8 per cent., and in 1883 had reached 1.1 per cent., and this in the general hospital. In Tarnier's pavilions, where antisepsis is most complete, the showings are still better. In 1876, the year after its establishment, there was one death in 88 deliveries; in 1877-8, two deaths in 438; in 1879, one death out of 182, and in the next 785 cases no death (to June, 1883). Later, these remarkable experiences were repeated in our own country, when Garrigues, in September, 1883—during the prevalence there of an epidemic of puerperal fever, with enormous mortality—introduced into the New York Maternity Hospital the antiseptic system, practically as used by Tarnier, and with the same wonderful results we have noted elsewhere; for in the 162 confinements following there was no death, and in 409 only three, from septic causes.

When we look on results like these we must not forget the man who suffered in their inception and defence, but say, with Schroeder,[1] "When we speak of the benefactors of humanity, let us place among the foremost the name of Ignaz Philip Semmelweiss."

Antiseptic Measures and Substances.

Of these we will only consider those which may be useful to us as obstetricians, giving first a synopsis of the various means and agents by which we can accomplish our end, and then what modern science considers the most effective.

Antisepsis may be accomplished in four ways:—

1. *By removal of the germs or products of decomposition.*

This would include the removal from the lying-in room of all unnecessary furniture, especially that which is old or stuffed, or drapery (and of unnecessary persons); the removal of settled dirt by scrubbing of walls and paint, and of floating particles by as thorough ventilation as possible; by bodily cleanliness of the patient, and by the removal from her of lochial or other discharges at proper intervals.

2. *By destroying them.*

By burning dressings, etc., which have been used in septic cases, and by thorough boiling in a disinfectant solution, of more expensive articles—bedding, etc., which have been exposed to contagion; by destroying, by oxidation, by free exposure to sun and air, noxious principles in mattresses, etc.; by receiving all excretions or discharges in a solution of some metallic salt, notably ferrous sulphate (sat. sol., *ad lib.*) or zinc sulphate (℥iv to cong. j.) or chloride (℥ ij to cong. j); by disinfecting all near privies or water-closets, by the application of one of these salts, or lime, or of some absorbent, as dry earth, charcoal or gypsum; and by the thorough fumi-

[1] Schroeder, Lehrbuch der Geburtshülfe. 1884. Achte Auflage, p. 445.

gation, at stated short intervals, of wards, rooms and furniture where women have been confined, or by the immediate fumigation of them when a septic case has occupied them—this fumigation being best accomplished by the use of sulphur dioxide, produced by burning at least three pounds of sulphur to every 1000 cubic feet of space to be disinfected.

3. *By preventing their access.*

By the use of lint, dipped into an antiseptic solution, placed over the exposed parts during labor, and by the use of an impermeable aseptic dressing during the puerperal state.

4. *By rendering them sterile or destroying them when present.*

Of the long list of antiseptics and germicides which have been used at various times for these purposes, we have only to consider *Mercuric Chloride* ($HgCl_2$), *Mercuric Iodide* (HgI_2), *Hydronaphthol* ($C_{20}H_7O,OH$), *Phenol* or *Carbolic Acid* (C_6H_5OH), *Boric Acid* (H_3BO_3), *Salicylic Acid* ($C_6H_4,OH, COOH$), and *Potassic Permanganate* ($KMnO_4$).

The *Mercuric Chloride* (bichloride), the first on the list at the present time, is entirely effective in a watery solution of 1–1000 parts, for all external uses; and in a solution of 1–2 or 3000 parts, at which dilution it is but slightly irritating, and in ordinary cases perfectly safe, for vaginal injections and washings, though for intra-uterine douching a still more dilute solution is safer, as quite a number of severe and even fatal cases of poisoning have resulted from the use of the 1–2000 solution. Stronger solutions than 1–1000 need never be used, and in no case should the very concentrated solutions of 1–75 or 100, in serum or other fluid, which have been advocated in surgical circles, be employed.

The *Mercuric Iodide* (biniodide), destined soon to supersede the chloride, has all of its advantages, with the additional one, that it is nearly three times as potent an antiseptic.

The results of some experiments made by Miquel, and published in *L'Annuaire Météorologique de Montsouris*, to determine the minimum amount of an antiseptic necessary to prevent fermentation in a litre of sterilized beef broth, show that bacterial life is impossible in a solution of one-forty thousandth part of the iodide, while of the chloride it requires the one-fourteen thousandth part to produce the same effect.

Experience in the use of antiseptics has shown that, in practice, they always require to be used of a strength several times greater than the minimum necessary to suppress bacterial life in experiments with sterilized solutions. On the human organism, the toxic effects of the iodide are nearly similar to those of the chloride when given in equal doses, and as we can use the iodide with equal effect as a germicide in a solution of only one-third or one-half the strength found necessary in the chloride, we surely will not run so great a risk of producing unpleasant symptoms from its use.

Dr. Bernardy[1] has recently called the attention of the profession to the

[1] *Am. Jour. of Obst.*, vol. xviii, p. 1093.

advantages of mercuric iodide, and has reported the results in three cases where it was used in a strength of 1–4000, in all of which it was exceedingly prompt in its action, being especially so in a septic case with very fetid discharges, where the chloride, of a strength of 1–2000, had failed. Of course, positive deductions as to its value can only be drawn from the results of its use in a large number of cases. Dr. Bernardy, in detailing his experience, says: "I have found the 1–4000 solution of the biniodide non-irritating. I have used it extensively in my gynæcological practice, and in washing out pus cavities, with good results. In it we have a preparation where the smallest amount of drug is used, with results far exceeding those of any other antiseptic. On account of the small quantity of mercury, there will be less chance of salivation." The method of making the solution is, to take three and a half grains of the salt, well triturated in a mortar, and rubbed with one quart of boiling water, slowly added, this giving a strength of 1 in 4390. It is very probable that a strength of 1 in 6 or 8000 will be found sufficient for reliable antisepsis. In the article just quoted, there is also the testimony of Panaz,[1] ophthalmic surgeon to the Hôtel Dieu, who shows that the iodide is as good an antiseptic as the bichloride, though used in a much smaller proportion, he saying: "I have convinced myself, after a number of experiments, that a solution in water, 1–10,000 of the bichloride, or a similar solution of 1–225,000 of the biniodide of mercury, is much superior to any other antiseptic solution employed in eye surgery."

Hydronaphthol ($C_{20}H_7O$, OH), a recently discovered derivative of naphthaline, was first introduced into surgical antisepsis by Dr. Geo. R. Fowler, of Brooklyn,[2] who considers it by far the most promising of the phenol series. It is a solid, not volatile at ordinary temperatures, but beginning to sublime at 93° C.; is freely soluble in alcohol, ether, chloroform, glycerine, benzole, and fixed oils; in hot water, in the proportion of 1 to 100, leaving a tarry residue (alpha-naphthol) which, however, does no harm. When cool the excess crystallizes out, leaving a solution of about 1 to 1000; cold water dissolves about 1 part in 2000, by agitation. Dr. Fowler has found it to be "non-irritant, non-corrosive, and non-poisonous," and though only soluble in water in the proportion of 1 part to 1000, in this proportion it is perfectly antiseptic. It has no odor, to disguise that of putrefaction, nor is it decomposed or rendered inert by the products of putrefactive decomposition. It will not injure, in any form, colors or textile fabrics. It is easily powdered, and may be triturated and used mixed with any inert powder, in the proportion of 2 to 4 per cent.

Experiments to prove its germ-sterilizing power demonstrated that as an antiseptic it is one-fifth as powerful as mercuric chloride, twelve times as efficient as phenol, thirty times as potent as salicylic acid, sixty times as sodium biborate, and six hundred as alcohol.

In making solutions of the hydronaphthol it is Dr. Fowler's custom to place a sufficient quantity in a teacupful of hot water to produce a milky

[1] *Phila. Med. Times*, May 16th, 1885. [2] *New York Med. Journ.*, Oct. 3d, 1885, et seq.

mixture, then water at the ordinary temperature is added until the solution becomes clear. In hospital irrigating jars the hydronaphthol may be placed in excess and warm water added and replenished from time to time, as the solution is drawn off. In private practice it is convenient to have powders made up of 7½ gr. each, which can be added to a pint of warm water when needed.

I should advise this as a good antiseptic for normal puerperal cases. Where it is necessary, in septic cases, to use intra-vaginal or intra-uterine injections, a solution of a mercuric salt should be used first, to destroy the morbific organisms,[1] which may be followed by the hydronaphthol, to remove any of the first solution which may have been retained, and thus lessen the danger of mercurial poisoning.

Phenol or *Carbolic Acid* is fairly effectual in a one or two per cent. solution, but is not as reliable as the mercurials, and is objectionable on account of its odor, which often but masks that of putrefaction, and the disagreeable numbing effects which it produces in the hands of the operator. Strong solutions (saturated 5 per cent.) are corrosive, and apt to produce well-known poisonous effects.

Boric or *Salicylic Acids*, in saturated solution, are good disinfectants, either for general use or for instruments, the first being especially used in cleansing the eyes of the new-born.

Potassic Permanganate, used of a strength just sufficient to slightly discolor the parts, is an active oxidizing agent, and may, on a pinch, be used for general obstetrical antisepsis.

Application of antiseptic methods in hospital and private practice.

The essential elements of successful antisepsis may be embodied in one word—cleanliness; and the most comprehensive rule for its application in two—be clean. So long as we attain this ultimatum it matters little how we proceed or what means we employ, pure water[2] showing as favorable a record in one man's hands as strong mercuric solutions in another's. The time will come when the validity of this proposition will be generally accepted. One antiseptic after another is deposed to make room for a successor, and, as our ideas of the subject become perfected and broadened, the strength of our solutions lessens while our attention to the details of cleanliness increases.

The precautions which enable us to insure our end, of necessity, vary with the conditions which surround the patient, whether she be in the germ-laden atmosphere of a hospital ward, or in the pure air of the open country.

In hospitals, where the conditions are such that, almost of necessity, the causative elements of puerperal disease are ever present, though perhaps, not always making their presence known by active morbific action, where infection once admitted is so easily carried from one to another, and

[1] Hydronaphthol is a germ-sterilizer (an antiseptic) and not a germ-killer (a germicide); a mercuric salt in moderately strong solution is a germicide, in weaker solution an antiseptic.

[2] Boiled, to free it from possible organic impurities. Used by Tait and Bantock.

where there are usually many avenues of contagion from external sources, here to attain our end requires the strictest discipline and most thorough method.

Wards should be small, containing only a few patients each, should have no unnecessary furniture, should not open into each other, should be well ventilated, and should have impermeable walls and ceilings, that they may be perfectly and easily washed and thoroughly disinfected at regular intervals.

Doctors and *Nurses* should not go from septic to normal cases, and should not expose themselves to possible contamination by visiting surgical wards, necropsies etc. Before examining a patient their hands and nails should be thoroughly cleansed by scrubbing with soap and water and the use of some disinfectant solution; they should also invariably be washed before going from one patient to another. Their garments should be kept scrupulously clean, as infection might easily be carried in a soiled coat or dress. Indeed, it is safest to change the clothing entirely, and take a warm bath with plenty of soap, a scrubbing brush, particularly to hands, hair and beard, before going from a septic to a normal case. If these precautions are habitually and scrupulously observed, it is scarcely likely that an infection can be carried by the physician or nurse. A physician whose finger nails are habitually in mourning should give up the practice of obstetrics. It is best to allow no visitors or outsiders to enter the lying-in wards.

Patients, if possible, should receive a full bath and fresh clothing before entering the delivery room. The external genitals should be thoroughly cleansed before the beginning of the second stage. Prophylactic injections at this time are not necessary or advisable, unless there should be a suspicious purulent vaginal discharge, or reason to suspect possible septic infection, as their use, by constringing the parts and removing the natural mucus, increases the liability to perineal laceration. Examinations should not be made too frequently, the hands being cleansed before each exploration, by dipping in an antiseptic solution. If lubricants should be necessary, on account of dryness and tenderness of the parts, vaseline or any clean vegetable oil may be used.

After delivery in normal cases, vaginal or intra-uterine injections are not necessary, and should only be used when the finger or hand has been introduced into vagina or uterus to remove fragments of placenta or membranes, or where the fœtus has been dead or macerated. Immediately after the expulsion of the child the vulvar cleft should be covered with lint wet in whatever disinfectant is used, which should be kept in place until the patient is washed and dressed; this washing should be with the disinfectant solution, and the dressing should consist of a binder and the occlusion bandage devised by Garrigues,[1] which should be put on carefully, being spread out in

[1] Garrigues: *Medical Record*, Dec. 29, 1883.—"The patient is washed with the solution ($HgCl_2$, 1-1000) and the vulva covered with a *dressing* consisting of a piece of lint, six by eight inches, folded lengthwise, so as to be three inches wide; outside of that a piece of oiled muslin, nine by four inches; outside of that a large pad of oakum; the whole to be fastened by four pins to the binder in front and behind, by means of a piece of muslin eighteen inches square, folded diagonally, like a cravat, so as to form a kind of belt, five inches in width, for the reception of the other pieces of the dressing. This dressing is to be put on with the same care as we dress a wound after a capital operation."

front and behind broad enough to entirely cover in the genitals and prevent the access of any floating particles of septic matter. For from eight to ten days, or so long as there is much lochia, the external parts should be carefully cleansed every six or eight hours, with an antiseptic solution, and the dressing renewed. No vaginal or intra-uterine injections are necessary unless the lochia should become fetid or the patient develop septic symptoms (see VI).

It should be borne in mind that if the bichloride be the antiseptic used, any abrasions or lacerations of the vaginal mucous membrane will become covered with a yellowish-white film, which may easily be mistaken, by the inexperienced, for diphtheritic infiltration (see VI).

It seems proper here to add a word concerning the use of Credé's method, essentially an antiseptic procedure, for preventing the development of ophthalmia neonatorum. After the birth of the child, as soon as the cord has been ligated, its eyes should be carefully and gently washed with soft lint dipped in a saturated solution of boric acid, and immediately a single drop of a two per cent. aqueous solution of silver nitrate let fall between the separated lids upon the conjunctiva, the surplus being washed away at once by the lint and boracic acid. This treatment sometimes causes a slight catarrhal conjunctivitis, lasting for a day or two, but never anything more serious, and is a most certain preventive of the ophthalmia so much dreaded in lying-in and foundling asylums.

In private practice, where our principal care is to avoid bringing infection to the patient, we do not always need the elaborate precautions just described, using only those which our judgment tells us are necessary, in addition to the routine scrupulous cleansing of hands, instruments and exposed parts of the patient, the removal of all shreds of membrane or placenta, and the application of the occlusion bandage.

In private cases, also, it is not necessary, unless we have reason to suspect the presence of a gonorrhœal discharge, to apply Credé's treatment to the eyes of the new-born, a simple washing with a solution of boric acid or clean warm water being all sufficient.

Dangers and Contra-indications of Mercuric Salts.—It is well to sound a note of warning regarding the possible dangers of the employment of the bichloride solutions so commonly recommended, for, in addition to the not infrequent slight salivation of patients or attendants, from the free use of this agent, we have also to record serious and dangerous symptoms, and even lethal poisoning.

At Schroeder's clinic, in Berlin,[1] in a recently delivered primipara, a complete perineal laceration, extending high up the rectal wall, was stitched up while irrigated with a 1 to 1000 bichloride solution. Between the fifth and sixth day the patient developed moderate fever, with low pulse and a very fetid diarrhœa, dying on the twelfth day. The autopsy showed

[1] Hofmeier, *Am. Jour. of Obst.*, 1884, pp. 518 and 935.

extensive gangrenous destruction of the entire mucous membrane of the large intestine, this condition continuing with lessening severity into the ileum. The kidneys showed congestive changes. An examination made at the Patho-clinical Institute demonstrated the presence of mercury in the tissues.[1]

In a second fatal case, at the same clinic, a young primipara developed slight eclampsia, was delivered by an easy forceps operation, and, suffering from uterine atony, was given a hot intra-uterine douche of three litres of a 1 to 1000 bichloride solution. Soon there appeared general depression, with great hyperæsthesia of the whole body, a subnormal temperature, and profuse fetid diarrhœa; these symptoms continuing until her death. The autopsy showed most extraordinary alterations in the intestinal mucosa, which was enormously swollen and partly gangrenous, the change being especially marked in the rectum and extending into the ileum. The kidneys were the seat of marked degenerative changes.

At Stadtfeld's clinic, at Copenhagen, a puerpera developing fever on the fifth day was given a large intra-uterine douche of the bichloride, 1 to 1500. She immediately showed slight collapse, and five days after, fetid diarrhœa, vomiting, and suppression of urine. The autopsy showed inflammation with numerous ulcerations of the large intestine and parenchymatous nephritis.

In a fourth fatal case, reported by Vöhtz, the fluid passed directly through the tubes into the peritoneal cavity.

Besides these fatal instances, numerous others are constantly being reported —in some the patient had received only one or two douches of a 1 to 2500 solution—where the symptoms, though serious, have been recovered from, these symptoms being in nearly every case expressed by a general constitutional depression, accompanied by a fetid, intractable diarrhœa, and the appearance of albumin in the urine. In nearly all we notice that the patients have had *previous renal disease*, or have been *weak* and *anæmic*, or that there has been *uterine atony*, or *extensive lacerations of the genital tract*, it being rare that the fluid has passed directly into the circulation or into the peritoneal cavity, as in the cases of Stadtfeld and Vöhtz.

A study of the cases just mentioned would show that in the above conditions mercurial douches should be contra-indicated, or should be used only in small amounts, and in very weak solution, preference being given to some other antiseptic, and that we should at all times be especially careful to insure easy escape of the fluid injected from the uterus, and free and complete drainage from the vagina, that portions of the solution may not be retained and absorbed.

[1] But little stress can be laid on the detection of mercury, for, as Taylor says ("Med. Jurisprud.," vol. i, p. 288), "Nothing is more common than to discover traces of mercury in the stomach, bowels, liver, kidneys, or other organs of a dead body."

VI.

PUERPERAL FEVER.

It is not my purpose to enter into a long discussion of the condition known as puerperal fever. I wish merely to state the conclusions at which I have arrived after a fairly large experience with the disease in several maternity hospitals abroad and here, as well as in private and consultation practice, which experience leads me to consider its nature to be as follows: I believe the majority of cases of so-called puerperal fever to be, in reality, cases of puerperal septicæmia, the septic infection coming usually from without, carried generally by the fingers, instruments, dressings, etc., and, no doubt, at times in the clothing or on the person of the attendant, but in exceptional cases transmitted through the medium of the atmosphere.

I am impelled to the last admission by the fact, that I have seen apparently spontaneous cases of puerperal fever in which all possibility of infection by contact could absolutely be excluded; neither physician nor nurse having for weeks previously attended a septic or contagious case. I have been unable to explain the occurrence of such cases except by transmission through the air by a so-called *status epidemicus* (I refer, of course, to cases in private practice),—unless I join the small minority of obstetricians, at the head of whom, in this country, stands Fordyce Barker, who still firmly believe in the occurrence of puerperal fever as a zymotic disease *sui generis*, that is, a disease produced by a specific poison of its own. I must confess that I have not been able to entirely divest myself of the belief that such a disease *may* exist, though I also believe that it is one of the rarest of exceptions.

Further, my experience has taught me that while, in many cases, the septic infection, however obtained, is the cause of the febrile symptoms, this infection may, in course of time (that is, provided the patient lives long enough), be thrown off and the symptoms still persist; the febrile condition will then be found to be due to some peri-uterine inflammatory process (see VII). The prognosis in this latter class of cases is vastly more favorable than that of cases due to septic infection pure and simple.

I do not propose to discuss the question of the relation of bacteria to the production of puerperal fever, since I cannot but consider the whole subject of bacteriology as in its infancy, and so unsettled as to leave it a matter of doubt whether, in the majority of infectious diseases, the bacteria produce the disease or the disease generates the bacteria. So long, however, as germs (bacteria, cocci, bacilli, etc.) are found in the secretions of infectious diseases, a safe plan, certainly, is to act on the principle that these germs should be removed with the discharges, and hence I advocate the use of germicide solutions, which also act as cleansing applications.

It will naturally be inferred that my views on the treatment of puerperal

fever—that is, septic fever—are precisely the same as would apply in the septic infection from open wounds in other parts of the body, namely, removal of putrescent tissues, scrupulous cleanliness, rational disinfection, reduction of supra-normal temperature, with sustenance of the general system. In the rare, presumably zymotic, cases, the necessity for disinfection will probably not be so urgent as where sepsis is present.

That the exanthemata cause puerperal fever I do not believe, for while after labor the maternal organism has lessened power to oppose the approach of disease, and is less able to withstand its inroads, scarlatina or other exanthem, when it appears at this time, still preserves its distinctive characteristics, though, perhaps, running an unusually malignant course; yet we cannot call it puerperal fever with any more show of reason than we could call a bruised digit from which the patient should happen to be suffering at this time a puerperal finger, or an acute nasal catarrh a puerperal coryza.

The *site of the infection* may be either at the vulva or in the vagino-uterine tract (lacerations of the perineum, vagina, and cervix; injuries to the uterine wall, decomposition of thrombi at the placental attachment, or of retained fragments of placenta, or of coagula; septic endometritis). It is of the highest importance to recognize and localize as much as possible the exact spot from which the infection proceeded, in order that the local measures may be directed chiefly to it, and, if still possible, the source of the infection be removed or its violence mitigated.

Varieties and Symptoms.—While various elaborate and minute classifications have been made of the protean forms of puerperal fever, practically we find that they blend so together, several forms often combining in one, and nearly every case showing peculiarities of its own, that, for purposes of bedside study, these divisions are misleading and confusing.

For strictly clinical purposes, and setting aside most pathological distinctions, our cases of puerperal septicæmia may be divided into three main groups: first, those most commonly seen, where the disease, beginning acutely, is of varying degrees of severity and often amenable to treatment; next, those types which begin gradually and insidiously, and linger in a chronic form, the patients dying, or as gradually passing back through the stages of convalescence to health; and last, those of an intensely malignant type, which appear and run their fatal course with appalling and terrible swiftness.

In all these forms of puerperal fever the first symptoms occur usually within three days after the labor; attacks coming on before this time are usually due to infection before delivery, while later the liability diminishes, so that if our patient reaches the seventh day without showing signs of infection she may be almost surely considered safe from sepsis; the exception to this rule being in certain rare cases where convalescence having progressed, apparently normally, even to the second or third week, a sudden elevation of temperature, with a chill and offensive lochia, show the insidious advent of

purulent endometritis and consequent septic infection. There is always a doubt, in these cases, as to whether the infection is auto- or heterogenetic.

In all the forms there are generally some premonitory symptoms, though these may often be overlooked, as they may occur equally from other slight degrees of morbid action, or disordered digestion, constipation, unusual irritation from breasts or nipples, physical or psychical disturbances, etc. The most usual of these symptoms are a tired and worn facies, with general malaise and a rise of temperature of more than a degree, a rapid pulse, severe and long-continued after-pains, tenderness of the uterus, loss of appetite, and slight tympanites.

These signs presage the more usual forms. At the inception of the fever proper we have a chill, light or severe, the severity being in direct proportion to the suddenness and extent of the temperature elevation. Coincident with the increased body heat which the chill announces the symptoms all become more decided, pain and tenderness over the uterus and abdomen generally become more marked, there is acceleration of the pulse and respiration, thirst, anorexia and general uneasiness increase, there may be nausea and vomiting, there is increased tension of the abdominal walls, the tympanites becoming more marked. Usually the higher the fever the more marked are these symptoms, though occasionally we will meet cases where even an extreme temperature rise is almost unaccompanied by other manifestations.

The progress of the disease may here be stayed, the symptoms all abating in a day or two, or they may continually increase, the pulse becoming very weak, thread-like, easily compressible, and above one hundred and twenty. The vomiting, which was at first merely of the contents of the stomach, now contains bile, or is a brownish, coffee-like fluid. Diarrhœa is present, or, less frequently, obstinate constipation. The breath acquires a peculiar sweetish odor and the skin shows a yellowish tinge, and often the numerous vesicles of miliaria. There is profuse sweating. The area of tenderness over the region of the uterus increases, the tympanites become very marked, the peritonitis which causes it spreading and often becoming general. The pulse becomes weaker and more rapid (130-160) the face, pinched and ghastly, is bedewed with drops of cold moisture, the lips become blue, the thick yellowish coating of the tongue brown and dry,[1] the hands shrunken and tremulous, and, together with the feet, cold and clammy. The mind may remain clear, but there is usually delirium or semi-coma. Here death usually claims the sufferer, though even when the appearances are most desperate the balance may be turned toward recovery. All or but a minority of these symptoms may be present in any given case. Locally we find the uterus large and flabby, but later on it may be fairly well contracted; the lochia, which may at first be temporarily suspended, are fetid, sanguinolent and purulent, or thin and acrid (looking and smelling like the washings from putrid meat); there may be pain and burning during defecation and micturition; the labia are often swollen and œdematous, especially where lacerations or bruises of the

[1] The tongue may remain clear and moist during the entire course of the disease.

vagina and vulva take on an ulcerative character and become covered with a grayish putrescent material, considered by some to be a true diphtheritic membrane.[1]

The next most frequent class of cases are those where the symptoms develop more gradually, and run a less rapid and usually less virulent course, the infection taking place slowly or by successive small increments; here the symptoms may be nearly the same as in the first group of cases, though less intense and less rapidly succeeding each other, the long continuation of the fever with the necessary sequences of long confinement to bed being more to be dreaded than its immediate virulence; or the progress of the disease may be marked by erratic chills followed by profuse perspiration, the temperature being very irregular, ranging from normal to 105° in a single day; the lochia scanty and not offensive; the tongue dry and brown or often moist and coated, and the general aspect like that of typhoid; or in severe cases the disease may not differ in any way from surgical pyæmia, metastatic abscesses forming in distant portions of the body, especially in the vicinity of the larger joints, and inflammation of the para- or perimetrium are often present, though general peritonitis in this condition is rare.

Though the infection in these cases may not show itself until the second or even, rarely, the third week after confinement, it is probable that it was incurred during labor, the absorption finally taking place from putrid matter contained in the cavity of the uterus or vagina, in a parametric abscess or ulceration in the genital canal, or more probably, from the breaking down of an infected embolus in some one of the uterine or para-uterine veins.

The most unfavorable of these cases of puerperal septicæmia are those in which the source of the infection is obscure; the patient complains of but little pain, no local inflammation can be detected, the lochia are sweet, and the high temperature, varying between 101° and 105°, forms the only alarming feature. A supra-normal temperature during the puerperal state is *always* due to a good cause, and may at any time mean serious trouble. If no more reasonable cause for the fever can be found than that of a perhaps obscure septic infection, it is a safe plan to assume such infection, and act accordingly.

In the third form, *septicémie foudroyante*, the organism is at once overwhelmed; the constitutional prostration is extreme and often the only symptom; the temperature may be anywhere from subnormal to very high, generally the latter; pain is not a noticeable feature; the pulse is weak, rapid and compressible; and, without rallying, the patient dies, the vital forces crushed and paralyzed by the intense virulence of the poison. Death occurs within the first twenty-four or forty-eight hours. In these cases the

[1] While true diphtheritis does undoubtedly occur in the puerperal period, it is not a common disease, is always attended with most serious manifestations and sequences; the child, if left with the mother, almost to a certainty becomes infected, usually dying from the effects of the malady, and the mother, if she recovers, passes through a long and tedious convalescence. The so called "diphtheritic patches" so commonly seen during the puerperal period may be allied to, but are certainly not, true diphtheria.

temperature is often elevated even during labor, the infection probably taking place at that time.

Puerperal Malarial Fever.

In certain neighborhoods where malarial influences prevail, puerperal women may develop high temperatures, preceded by a chill, which simulate septic infection, and for several days may be entirely undistinguishable from it. The absence of local symptoms (pain and fetid lochia) shows the non-puerperal etiology of the fever, and the malarial surroundings will assist in making the correct diagnosis, which is confirmed by the rapid and striking antipyretic effect of large doses of quinine. If the malarial conditions continue, the chill and temperature may return, or persist in a more or less marked manner for weeks, and only a change of residence will effect permanent relief.

Pathology.—While it is not necessary to enter into a detailed description of the various pathological changes which may occur as the result of puerperal inflammation, it is well to have a general idea of the morbid changes and appearances which we may find post-mortem.

For a week or more after labor, in cases dying from other than puerperal disease, we find the inner surface of the still dilated uterus rough, especially at the insertion of the placenta, and covered with blackened, gangrenous-looking shreds of blood, mucous membrane and placenta. This condition should not be mistaken for the much more marked changes caused by septic inflammation, where, in one set of cases we may find a more or less extensive gangrenous inflammation of the interior of the uterus, with the sloughing off of shreds of necrotic tissue and the consequent formation of deep ulcers, which are apt to be accompanied by severe para- and perimetritis, or where the inflammation has been of a croupous character, and has affected the vagina, we find areas of necrosis, gangrene and ulceration; while, with or without either of these forms of inflammation there may be uterine thrombosis, purulent inflammation of the veins or suppuration and abscess of the uterine wall, and, owing to the spread of the infectious material by the blood, metastatic abscesses in various organs. The lesions of acute pleurisy, ulcerative endocarditis, purulent inflammation of the joints, hyperplastic swelling of the spleen and lymph glands, may be present, as in any acute infectious disease. In the excessively malignant cases of the third group the local lesions are but slightly marked, and general alterations, except those due to high temperature, entirely wanting.

Micrococci are very constantly present in the inflamed tissue, lymph vessels of the uterus, peritoneal exudations, and pyæmic abscesses, and it is not improbable that the destructive local lesions as well as the general constitutional infection are due to the presence of these organisms.

Prognosis.—It is difficult to state definitely the prognosis in any given case of puerperal fever, a fatal form often beginning and running its course with

but slightly marked symptoms, while a patient *may* recover after the most severe manifestations. Death is the rule when a majority of the symptoms described in the first group are present, when the disease assumes a pyæmic form, and when its onset is sudden and overwhelming. Generally the longer the beginning of the disease is delayed, the better the constitutional condition; the slower and stronger the pulse, and the lower the fever, the better is the prognosis. Convalescence may be rapid and complete, or, where there have been marked inflammatory changes in the uterus and its adnexa, or the debility is very great, slow and tedious.

TREATMENT.—"An ounce of prevention is worth a pound of cure." In no department of medicine is the truth of this old proverb more strikingly illustrated than in that which appertains to the treatment of the lying-in woman. The vital importance of prophylaxis has already been shown in the chapter on antisepsis, and its teachings should be strictly carried out. While we can in many instances prevent the access of the products of decomposition, or prevent their development when present, when once the septic germs have gained entrance to the fluids of the maternal organisms, their ravages are beyond our control; we can only endeavor to find and bar the avenue of their entrance, while at the same time we sustain, as best we can, the vital forces in their struggle with the enemy.

It is important to recognize the very beginning of the infection, for the sooner it is detected the more certainly can we counteract it. As the point of infection is always in some part of the genital tract, usually from some lesion of the vagina or cervix, it is very evident that local treatment is a primary necessity.

Local Treatment.—The vaginal orifice should be examined with reference to the presence of necrotic patches, which, when found, should be touched with a mixture of equal parts of liquor ferri persulph. and tinct. iodi comp., this solution possessing very marked and powerful antiseptic and astringent properties, disinfecting and preventing absorption at the same time.

At Winckel's clinic, at Munich, in cases of true vaginal diphtheritis, characterized by great constitutional depression, very high temperature, weak and irregular pulse of from 120 to 140, and stinking lochia, the exudations are cauterized with sesquichloride of iron, with remarkable results, the temperature falling as quickly and markedly as after intrauterine irrigation in pure septicæmia. This treatment sometimes causes great œdema of the parts adjacent to the ulcerations, which, however, is easily controlled by simple evaporating lotions.

A vaginal injection properly given can do no harm, and should be used if there is the slightest fetor to the lochia, or where we suspect the presence of infectious material in the vagina; it should consist preferably, on account of its germicidal powers, of a solution of bichloride (1–2000), or biniodide of mercury (1–4000), retained portions of which may be, to prevent the risk of

ible poisoning by absorption, washed out by a solution of hydronaphthol lain boiled water.

clean fountain syringe should be used, with a vaginal tube of glass, t three-eighths of an inch in diameter and six inches long, with a ded bulb, having several side holes but no central (terminal) opening. external parts should be first washed, and with the stream running, the should be gently inserted into the vagina, the perinæum being some- t depressed to allow of the free escape of the fluid. If the uterus is ned to become relaxed it should be controlled by a hand placed over the us. When considered necessary to flush out the vagina after the use of g mercuric solutions, the fluid used is poured into the bag of the syringe re it is quite empty, while, to avoid the possible entrance of air bubbles, xit tube is momentarily compressed between the thumb and finger. dents can only happen through gross carelessness or ignorance.

ould we find no cause for infection in the vagina or cervix, having used, cessary, a bivalve speculum to make our investigation certain, it is able that the septic foci are contained in the uterus, and a careful digi- xamination and washing of the uterine cavity is then indicated. If the r detects in the uterine cavity any secundines or coagula, these should

FIG. 168.

MUNDÉ'S PLACENTAL CURETTE. Length of whole instrument 16"; width of loop ¾".

ce be thoroughly removed with the finger or the large blunt curette . 168), and the uterus then irrigated. This should be done with most ulous precautions, the vagina being first thoroughly cleansed and ren- l aseptic. The tube used should be of thick annealed glass, about one- of an inch in diameter, bent to conform to the uterine axis, and pierced s last four inches with eight or ten small openings, it having or not, ding to the fancy of the operator, a terminal perforation.[1] The fluid to jected should be a warm (99°–100°), weak (1 to 3 or 5000) solution of a uric salt or of hydronaphthol, or even simple, clean, boiled water. If a

bject to a central terminal opening in vaginal and uterine tubes, for the following reasons:—
cause, with a vaginal tube with central opening, the fluid may inadvertently be thrown into the cavity, and thus, at a period when the uterus has undergone more or less involution, may cause severe colic and alarming collapse. I saw this occur in one case on the ninth day, the vaginal injection be- n by the nurse merely for the purpose of cleanliness.
lhough not often likely to occur, it is still not impossible that the jet of injection fluid thrown from tral terminal opening of a uterine tube may dislodge a fresh thrombus at the placental site, and air e venous circulation, or a secondary hemorrhage be produced. That the introduction of air into the ay thus take place has been proved in several cases of intended criminal abortion which came under rvation of a medical examiner in Massachusetts, and were reported in the *Bost. Med. and Surg Jour.* years ago, air bubbles being found in the right heart.
ler that this may not occur with side openings it is well to have the latter so arranged as to throw the htly backward.

mercurial be used it should be followed by enough of the hydronaphthol or water to wash away any which may remain in the uterus, and so lessen the danger of poisoning. Whatever fluid is used should not exceed in amount two or three pints, should be injected slowly, and should be delivered from a clean fountain syringe or douche jar, held about two feet above the level of the patient. A bed-pan should be placed under the woman's hips, and, all being ready, the fluid should be allowed to flow through the tube, so as to positively exclude the danger of injecting air into the uterus, and while still flowing the tube should be passed into the vagina, and, guided by two fingers of the left hand, passed gently into the cervical canal and up nearly to the fundus, or, if we choose, we can pass the tube through the speculum. A free escape of the injected fluid should be insured by pressing the anterior lip of the cervix a little forward with the tube, and depressing the perinæum somewhat with the fingers. The advantage of the inflexible tube is that the position of the external os and the direction of the uterine canal having once been ascertained, the tube can often be passed by an experienced operator without the introduction of the finger. The tube need not necessarily be made of glass, though I prefer that material, on account of the greater ease with which dirt can be detected and removed.

If the uterus contains any septic matter, shreds and bits of tissue will escape with the first portion of the fluid, which may also have a more or less putrescent odor. If the fluid returns clear and clean there is usually no need for repeating the injection. So long as we do good by removing septic material I believe in continuing the intra-uterine douching; but having accomplished this end we only submit the patient to needless interference by repeating the procedure.

When the lesion is found to be in the vagina, as is usually the case, douches may be given every four to six hours; when in the uterus, every six to eight hours or oftener, if the fetid discharge continues and the temperature falls after irrigation. In regard to the frequency of the injections, however, every case must be a law to itself, the repetition being governed by the effects produced.

Intra-uterine douching should not be resorted to unless the infection can be shown to proceed from the uterine cavity, and is not indicated by every little rise of temperature which a puerperal woman may show. It is generally proper to wash out the uterus when fever follows the birth of a dead and macerated child, or an operation which has necessitated the passage of hand or instruments within its cavity, or where there is a fetid discharge which persists in spite of vaginal douching, where the uterus is large and flabby, or where we have reason to suspect the presence of decomposing bits of placenta or membrane within its cavity.

I desire to put myself on record in this matter of intra-uterine injections, which have been recommended by eminent authors in every instance of rise of temperature in the puerperal state. I do not agree with this practice unconditionally, for if there be no fetid lochia, no evidence of intra-

uterine decomposition, I believe there is nothing to be gained by intra-uterine irrigation, even though there be a rise of temperature. On the other hand, the presence of offensive lochia without a rise of temperature does not necessarily call for intra-uterine irrigation, since many women have offensive lochia without the slightest constitutional disturbance. In such cases I think vaginal irrigation all-sufficient. I wish to qualify these statements by saying that even in the absence of offensive lochia, if there be no obvious cause for the elevation of temperature, it may be a wise precaution to irrigate the uterus once or twice, but after such irrigation, there being no detritus removed from the uterus, I should consider further irrigation useless, and, perhaps, even injurious, and whether the temperature fell or not I should then look elsewhere for the cause of the rise, and seek to reduce it by other means.

Finally, I believe that intra-uterine irrigation should be discontinued as soon as it fails to remove decomposing matter from the uterine cavity, even though the temperature may not be reduced, for I think that I have seen the continuance of uterine irrigation under such circumstances cause hemorrhage, chills, abdominal tenderness, and be even followed by increase of temperature, which symptoms I am inclined to attribute to the traumatic irritation caused by the passage of the tube and the injection.

I think it important to state that a severe chill followed by rise of temperature even up to 103°+, with or without severe uterine colic, may occasionally follow an intra-uterine injection, even when given carefully by an expert through a widely patulous uterine canal. I have seen this apparently alarming result follow, not only an ice-water injection (when one might not unnaturally expect a chill), but once an irrigation of hot sublimated water. In patients who show this unpleasant susceptibility to uterine irrigation, it is well to avoid using it except under the urgent indications specified. The occurrence of the chill very soon after the irrigation will tend to show its true etiology, and the fever usually subsides within a few hours, under the usual measures.

Where there is an inflammation of the uterus or endometrium, suppositories of iodoform[1] introduced into its cavity produce very complete and lasting disinfection, exert a favorable influence over the inflammatory process, and seem never to exert any poisonous influence. They may be inserted by seizing the suppository with a strong pair of dressing forceps and sliding it into the cervical canal over two fingers of the left hand placed in the vagina against the cervix; these fingers can then shove the bacillus beyond the internal os; or if not able to insert it in this manner, we can place the patient on the side and insert it through Sims' speculum.

The insertion is often difficult because of the inflamed and tender condition of the parts and the irritable state of the patient, and though more easily introduced through the speculum, the use of the instrument, for obvious

[1] The formula recommended by Spaeth and Braun, of Vienna, is as follows: ℞. Iodoformi, grm. xx; gummi acaciæ, glycerini, amyli, ää grm. ij. *Misce lege artis et fiant bacilli* No. iij. I consider those made up with cocoa butter to be just as useful, and they are much easier to make.

reasons, is often not feasible at this time, hence my experience with this undoubtedly useful agent is limited, and I hardly think that the majority of general practitioners will find its use practicable.

Symptomatic Treatment.—The symptoms that usually demand our attention, though mutually dependent upon each other, may be divided, for our purpose, into three groups; first, those caused more particularly by the localized inflammatory processes going on; second, the high temperature; and third, the constitutional depression.

1. The first indication is usually to stay the progress of the peritoneal inflammation, if present, and to relieve the pain which it causes, and this can most readily be done by the conjoined use of narcotics and local applications. This pain is usually severe, of a lancinating character, associated with shallow, hurried breathing, and is best controlled by the hypodermic injection of morphia, the amount of the alkaloid which will be required for this purpose varying greatly. In localized inflammations, from one-fourth to one-half of a grain may be enough, while if the peritonitis is more general, larger doses are required, enormous amounts being sometimes tolerated. Enough should be given to quiet pain without producing narcosis, and when this end is secured, the action should be kept up by the administration of smaller amounts, as may be necessary, the drug being continued as long as the indications remain. Where pain is not marked, as in the solely septic and pyæmic forms of puerperal fever, opiates are not well borne, and seem rather to do harm than good.

Other narcotics, as chloral or cannabis indica, are valuable, though not so reliable as opium. The doses given must, as with morphia, depend upon the severity of the symptoms, enough being used to make the patient comfortable and to keep her so as long as may be necessary.

At first, and so long as the temperature remains high, dry cold over the seat of inflammation affords great relief to the pain, and is a powerful means of checking the inflammatory process. Cold may be applied by ice-bags laid over one or both groins, as may be necessary, this means being best when the inflammatory area is small and the temperature not particularly high; better, by the use of a rubber coil, through which a current of ice water is made to circulate; or, in the absence of either of these means, by the use of ice-water compresses, frequently renewed. A thickness or two of cloth should always be placed between the bag or coil and the skin, that the local action of the cold may not be too intense. I have known the integument to become slightly frozen from neglect of this precaution.[1]

After the first violence of the symptoms has subsided, and when the temperature can be kept down by other means, cold should be discontinued and

[1] My assistant, Dr. Wells, tells me that, in a case which he saw not long since, where there was an exudation with much pain and tenderness to the left of the uterus, and high fever, an ice-bag had been left on the bare skin for two days, a superficial slough afterward occurring over the area covered by the bag. The patient recovered and the exudation disappeared, hastened in its absorption, no doubt, by the irritation caused by the condition of the integument.

warmth applied, by means of hot compresses or poultices, it having a more marked beneficial effect on the progress of the inflammation, and being exceedingly grateful to the patient.

Counter-irritation is valuable, and is best produced by the application of a turpentine stupe, repeated *pro re nata;* at a later period, when more prolonged irritation may be needed, blisters are useful. Tincture of iodine painted over the painful area, and covered with a compress, formed of a piece of lint or flannel wet with a mixture of equal parts of glycerine and a two and a half per cent. solution of carbolic acid, and this covered in its turn with oiled silk, forms a very pleasant and efficient counter-irritant.

The local abstraction of blood by means of leeches, though not much used here, is recommended by French and German authorities, and is undoubtedly efficacious in relieving both the inflammation and the pain, especially in plethoric subjects. General venesection is not to be thought of under any circumstances.

As a forlorn hope in some desperate cases of general puerperal peritonitis, with large purulent effusion, laparotomy may be done, and the peritoneal cavity cleansed by the use of a warm antiseptic lotion, this apparently foolhardy measure having been in some rare cases successful.

The distressing tympanites which so often accompanies peritoneal inflammation may often be much relieved by the application of turpentine stupes to the abdomen, and by the use of enemata containing about half a drachm of spiritus terebinthinæ mixed with castor and sweet oil. When these measures fail, a long rectal tube, carefully introduced, sometimes allows the flatus to escape, and when the symptoms demand it, all other means having failed, we may aspirate through the abdominal wall.

2. Since we have learned that a high temperature is in itself very injurious, by causing a more rapid oxidation and waste of the tissues, thus leading to enfeeblement of the entire organism and especially of the nervous centres, and that the increased rapidity and loss of power in the heart's action are caused by, and not the cause of, the febrile rise, we have also learned to employ in place of the old cardiac sedatives means and agents having a distinct inhibitory action on the production and maintenance of supra-normal heat.

This reduction of temperature may be accomplished in two ways: by the internal administration of drugs—lessening the production—and by external means—abstracting the surplus.

Of internal remedies *antipyrin*, as a pure heat-reducer, heads the list. As it has a somewhat depressing action, in common with all antipyretics, it should usually be given combined with alcohol in some form, and, where the heart is weak, with digitalis. As the fall in temperature which it produces is, though marked, not usually permanent, the best results will be obtained by repeated doses, a first dose of fifteen grains being given, and followed at intervals of an hour or so, as may be necessary, by doses of from five to ten grains until thirty to forty grains have been given. This quantity may be

repeated within twelve to twenty-four hours, if necessary. Used in this manner, I have uniformly obtained most excellent results, cases being exceptional where the temperature could not be markedly reduced and kept so. I do not think it advisable to give it in the large doses (gr. xxx-lx) recommended by some, as I have seen severe collapse follow a single dose of forty grains; on the other hand, I have never known of any ill effects produced when given as above described.

While heat-depressing drugs, as a rule, act, for the most part, by an influence on the tissue oxygenation, *i. e.*, by lessening the production of heat, the effect of antipyrin is probably principally due to the profuse sweating which it causes, this increasing markedly the abstraction of heat from the body surface.

Thallin, a drug similar to antipyrin, seems to be no more effective and less reliable than antipyrin. I have never used thallin.

Quinine, as an antipyretic, is a valuable agent, though in the majority of cases far greater reliance can be placed upon antipyrin as a means for reducing supra-normal temperature. When used in the continued forms of fever quinine should be given in a single large dose of from twenty to thirty grains, so as to produce a marked remission, the temperature often falling below 100° F. after its use. When the cinchonism, the disagreeable features of which may be much lessened by the conjoined use of bromides, has disappeared, should the temperature rise another dose may be given, though in cases where the first dose has not reduced the fever, it is not probable that a second will be of value.

In the remitting forms of fever it is more valuable, and, given in five-grain doses every four or six hours, moderates the fever, lessens the gastric and intestinal irritation, diminishes the sweating, and seems to have a general tonic effect. Capsules of Warburg's tincture sometimes act well when quinine itself has failed.

Salicylate of Sodium.—Second only to quinine as an antipyretic before the introduction of antipyrin, it is now but little used except in cases where there is a rheumatic diathesis.

Alcohol, in addition to its sustaining effect upon the general system, is an antipyretic of considerable power, and should be used combined with other remedies in every case. While usually the dose will be about a couple of drachms every two hours or so, it may require to be given in very much larger amounts, the quantity being regulated by the effect produced. So long as it produces good effects and does not cause symptoms of intoxication, we are not giving too much.

Where the fever is very high, or where there is peritoneal inflammation, the external application of cold should always be employed, the rubber coil before mentioned being a most efficacious and safe method of reducing the temperature, one which is grateful, which can be applied without disturbing the patient, and which can, with benefit, be continued as long as the inflammation continues active and the temperature supra-normal. It is a measure

which I can most strongly recommend, and which I use in nearly every case of puerperal fever.

Where the temperature is very high, and the coil does not reduce it rapidly enough, sponging the whole body with equal parts of alcohol and water, continuing the sponging for about ten minutes, and repeating the procedure after about the same interval, until the temperature is decidedly lowered, may be necessary.

I do not often have occasion to use the cold wet pack, the cold bath, cold affusion, or cold uterine or rectal irrigation, the coil being usually sufficient, and these last means, though undoubtedly efficient, being liable to produce alarming cardiac depression.

The good effects of cold are not produced alone by the immediate abstraction of heat, but also by a direct lessening of its production, through the medium of an influence exerted through the sympathetic and the medulla oblongata, as is shown by the continued fall in temperature for several hours after its continued application in a moderately severe degree. This secondary effect on the nervous system causes the application of cold to be a peculiarly valuable means of reducing temperature.

3. It is most important that the strength of the patient should be maintained, and as the appetite and power of assimilation lessen with the onset of the fever, and oftentimes completely fail, how to nourish the patient is often a difficult and perplexing question.

The food should be in liquid form and not too concentrated, and is best given in small amounts, at short intervals. Milk, either plain or peptonized, or as punch or egg-nog, is the best food, but sometimes disagrees with the stomach. Animal broths are often acceptable and appetizing, though they contain but little nutriment; the same may be said of the numerous "meat extracts." Light and delicate custards may be acceptable. Stimulants are useful, but must be given with discretion, champagne, tokay, old port, cognac, being most useful. Where there is a tendency to nausea, the food should be given ice cold and in very small quantities at a time, a teaspoonful often being retained and digested where more would be rejected. In the early stages, hot water may be serviceable in checking nausea; later, small bits of ice, or ice-cold carbonic water, or iced champagne, or small doses of strychnia, will be found most serviceable. When the vomiting is convulsive, the inhalation of a few drops of amyl nitrite, at long intervals, is usually an efficient measure in checking it.

When the stomach cannot retain or digest food at all, we may be obliged to resort to rectal alimentation to sustain the patient. When this procedure becomes necessary, the bowel, if it contains fecal matter, should first be cleansed by a copious enema of cold water, this also having a good effect in checking any tendency to diarrhœa which may be present, and after a half-hour's rest, the nutritive fluid, at about the body temperature, should be gently injected, the patient being assisted in retaining it by the pressure of a folded napkin over the anus. These nutritive enemata should not be repeated

oftener than once in four or six hours, and to promote their absorption, when their long continuance is necessary, the bowel should be washed out every other day with cold water. The nutritive injection should not be too bulky, measuring not more than from two to three ounces; a very useful formula being the yolk of an egg, half an ounce of brandy, and milk to make two ounces, to which an opiate may be added, when required, or a pancreatinized mixture of an ounce each of lean, very finely minced meat and milk may be used, to which, if necessary, brandy or other drug may be added after the artificial digestion is complete.

Purgatives are not often indicated, for when once the fever has begun, there is usually a tendency to diarrhœa, though at the very first, if the bowels have been constipated, a mild aperient is useful, or, preferably, an enema may be given. Marked diarrhœa should be checked. I have found astringents, bismuth and opium generally efficacious. In Germany, good results are obtained by a voluminous injection of cold water, either pure or to which a little of some astringent, as ferric chloride, has been added. This injection, to be effective, should be passed as high in the gut as possible, through a rectal tube or large elastic catheter.

A question which naturally arises to every practitioner who expects to be called to other confinements while he is still attending or has but lately ceased visiting a case of puerperal fever, is, *how soon is it safe for him to take charge of another labor case?*

The rule and only safe practice certainly is, *never* to visit a normal confinement case while attending a septic case of any kind. Consulting obstetricians who are obliged to see septic obstetric cases and operative obstetric cases in rapid rotation, seldom can be justly accused of carrying an infection, if they will but observe the cardinal rules of scrupulous personal cleanliness, thorough disinfection, chiefly of hands and nails, hair and beard, entire change of clothing, frequent bathing, and use the precaution never to go directly from a septic to a clean case, but always to employ beforehand the disinfectant precautions just mentioned. I know that I have *never* carried septic infection, simply because I observe these rules with unvarying exactness. Practitioners who have been so unfortunate as to have a succession of septic obstetric cases, would, however, do well to give up all obstetric work for at least two weeks, while following the above disinfectant directions. Scrupulous cleanliness, in my opinion, is identical with thorough disinfection.

Fig.1.

Fig.3.

Fig.4.

Fig.5.

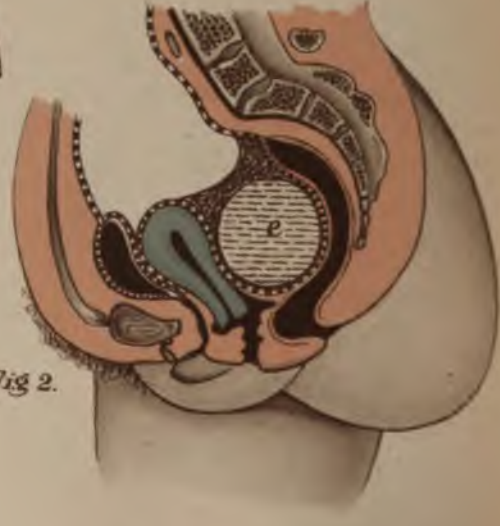


Fig 2.

PLATE XI.

Modified and reduced from Fritsch's plates for clinical demonstration.

FIG. 1.

Vertical section of pelvic organs, showing (*e*) exudation in the cellular tissue, before and behind the uterus and in the anterior abdominal wall (pelvic cellulitis), *a–b* shows plane of transverse section of Figs. 3, 4 and 5.

FIG. 2.

Vertical section, showing (*e*) exudation in Douglas' pouch separated from healthy peritoneal cavity by adhesions (pelvic peritonitis).

FIG. 3.

Transverse section through pelvis; conditions normal; *u*, uterus; *r*, rectum; *b*, bladder; *u r*, utero-rectal ligaments; *r l*, round ligaments; *b l*, broad ligaments. Light spaces show sections of peritoneal pouches.

FIG. 4.

The same, with small exudation (*e*) to left of broad ligament (pelvic cellulitis).

FIG. 5.

The same, with large exudation (*e*) in right broad ligament, extending into the cellular tissue of the anterior abdominal wall (pelvic cellulitis) and distorting the pelvic peritoneal pouches.

VII.

PUERPERAL PERITONITIS AND CELLULITIS.

THE disease which at the outset most closely resembles puerperal septi-
mia, is that characterized by an inflammatory exudation into the tissues
rrounding the uterus, that is, a puerperal peri-uterine peritonitis and
llulitis. In the early stages of a febrile disturbance in the puerperal state
is impossible to differentiate between a constitutional affection (septicæ-
ia) and a local inflammatory affection, since both present similar subjective
mptoms. Both are usually ushered in by a chill, which marks the beginning
a period of high temperature with more or less marked morning remissions;
each there is more or less tympanites and local tenderness, possibly fetid
hia, vomiting, etc., so that for several days it is absolutely impossible
n for the expert to say whether the symptoms are due to septic infection
to localized inflammation, or to both.

After an anxious week, or perhaps even sooner, a distinct fullness, or
itive exudation is detected, usually in the region of the broad ligament,
ugh it may occupy any of the peri-uterine tissues. This exudation begins
a diffused thickening, which gradually becomes more circumscribed, hard
l distinct, the uterus at the same time becoming more or less firmly fixed,
l at times displaced laterally. Symptoms of dysuria and tenesmus are
to be present when the exudation is very large, and the thigh of the
cted side is kept flexed, to relax the muscles of the iliac space. The
a of inflammation is usually exquisitely tender and fairly hard to the
ch, though it should be stated that it may require a practiced finger to
ect the exudation in cases only moderately pronounced. The perimetritic
tting together of adjacent viscera may give rise to misleading impressions
the presence of exudation tumors. The lochial discharge may by this
ie become sanguinolent, when its offensive character will generally
appear.

When the disease has reached this stage the temperature usually remits
nost to the normal in the morning, but may reach 104° to 105° F. in
afternoon. There is occasionally considerable pain on the affected side
the abdomen, and considerable tympanites. The exudation may occa-
nally extend outward and upward through the folds of the broad ligament
the iliac fossa, and then be felt by the finger on percussion through the
lominal wall. The uterus is generally in a condition of marked subin-
ution, but there is no offensive discharge unless the temperature has been
y high. If the inflammation and exudation have been chiefly intra-peri-
eal there is more tympanites than if the disease is situated in the
a-uterine cellular tissue, these symptoms being the more marked, the more
inflammation has extended over the general peritoneal surface.

In making the diagnosis the appearance of the facies of the patient, the absence of the sweetish odor of the breath, of the sallow complexion, of the repeated hectic flushes, of the dry, coated tongue, and the recurring rigors—these negative signs all serve to indicate the probable absence of septic infection.

In a certain number of cases the symptoms, both local and general, indicate a combination of localized inflammation and general septic infection.

Course and Prognosis.—It has already been indicated that the prognosis is much more favorable in these cases than in general septic infection. The more clearly we can recognize the presence of para-uterine inflammation, and the less the extent of the general peritoneal inflammation, the better are the patient's chances. I can fairly say that the great majority of these localized inflammations recover, the tumors either resolving or suppurating. In rare instances pyæmia or septicæmia may develop. When the exudation tends to resolve all the symptoms improve, the fever grows markedly less and soon disappears, the swelling grows less tender, harder, smaller, and more clearly defined, and after a varying interval disappears, either completely or leaving induration or adhesions behind. As regards the complete restoration to health, we should not forget that these adhesions between the uterus, its adnexa, and the intestines are liable to remain, and may cause, from their mechanical obstruction, obstinate constipation with accompanying pelvic pain and weak digestion. In these cases, again, even when the trouble may have apparently ceased, any unusual exertion or exposure is liable to excite fresh inflammation, and entail fresh complications.

Large exudations, particularly those into the cellular tissue, are more apt to break down and suppurate during the post-puerperal period than when occurring in the non-gravid condition. When this unfortunate complication occurs it can generally be referred to extreme weakness and exhaustion of the patient, or to some imprudence. The temperature continues elevated and shows, as in hectic fever, marked exacerbations and remissions, the pulse remains weak and rapid, there are usually repeated chills, appetite is lost, and there is often severe pelvic pain. It is often difficult to demonstrate the presence of pus, fluctuation being obtained easily only when we can feel with one hand the wave produced by the other, or where the tissue intervening between fingers and fluid is thin. Œdematous infiltration of the surrounding tissues may give a very deceptive impression of the presence of pus, and the tumors sometimes formed by the matting of intestine have been mistaken for purulent accumulations. In most cases the diagnosis can be made by careful abdominal palpation and bimanual (abdomino-vaginal) examination, the exploring needle being called in, if necessary, to settle the question. The abscess, once formed, may open spontaneously, or become encysted or absorbed. Spontaneous rupture may take place into vagina, rectum, bladder, a coil of intestine, uterus, through the abdominal wall, or

exceptionally into the peritoneal cavity,[1] in this latter case at once lighting up a usually fatal general peritonitis. Where a natural fistula is formed there is danger from the exhaustion from long continued suppuration, from septic absorption, and from amyloid visceral degeneration. Where the pus becomes encapsulated it may remain for a long time innocuous. The ultimate prognosis may, therefore, be very materially influenced by these eventualities.

The great majority of pelvic abscesses follow puerperal exudation into the pelvic cellular tissue, occurring as often after premature delivery as after labor at term, and complete restoration to health, both as regards the immediate febrile condition and the later resolution of the abscess, is the rule.

Treatment.—At first the treatment should be similar to that described in the previous chapter, with the exception of the disinfectant irrigation, intra-uterine and vaginal, which, as the indications are wanting, should be omitted. The temperature may in these cases remain high, with morning remissions, for from two to three weeks, or longer, and will then simulate very closely that of peritoneal inflammation in the non-puerperal state. I have felt myself obliged to keep on the ice-coil and employ antipyrin *pro re nata* for nearly three weeks, in several severe cases in which complete recovery took place.

After the temperature has been reduced to normal, persistent blistering is of the greatest use in promoting absorption of the exudation, one blister being followed by another so soon as the former is healed. In the interval between the blisters, hot poultices covered with oiled silk should be conscientiously applied so long as the size of the exudation or local pain keeps the patient in bed. In mild cases tincture of iodine with or without poultices will usually suffice.

Should suppuration occur the pus should be thoroughly evacuated, the abscess cavity washed and kept clean and freely open, there being always danger of septic infection where the pus is at all confined.

In very small abscesses, holding not more than an ounce, aspiration may be all sufficient, but in larger cavities the best results will be obtained by free incision and drainage, after which the abscess cavity soon contracts and cure generally follows. Where the abscess has taken on a more chronic form, and deep sinuses have formed, the chances of total recovery are not nearly so good, though even here, the treatment by free incision and drainage, with, perhaps, curetting of the abscess walls, gives the best results.

It is almost needless to remind the attendant that it is most important to sustain the general health and strength of the patient, at first by stimulation, and later by tonics and nourishing food. The administration of preparations of iron, in my experience, materially hastens the absorption of large exudations, especially where the patient is very anæmic.

[1] See articles by the author, on treatment of pelvic abscess, in the *Arch. of Med.*, Dec., 1880, and *American Journ. of Obst.*, Feb., 1886.

VIII.

LACERATIONS OF THE GENITAL ORGANS AND THEIR INFLUENCE ON THE PRODUCTION OF SUBINVOLUTION AND ALLIED PATHOLOGICAL CONDITIONS.

After a normal labor, and where the tissues of the genital tract have undergone no extensive injuries from their laceration during the passage of the fœtus, the usual physiological involution of all those parts immediately concerned in the function of parturition is completed, or nearly so, by the end of the second month after confinement. How different do we find the condition when, the cervix or perinæum having been torn, their ununited, granulating, hyperæmic surfaces become a seat of constant irritation, the congestion and hyperæmia, normal factors in every granulating wound, though pathological elsewhere, being confined not alone to the immediate vicinity of the lacerated surface, but extending throughout the whole of the contiguous parts, and thus preventing or seriously impeding the normal retrograde metamorphoses which should occur after childbirth.

It is my intention here to discuss the causative influences which lead to the lacerations of the cervix and perinæum (other lacerations, such as ruptures of the uterus, etc., not coming within the scope of this paper), and to speak of the pathological results which may follow these injuries, so that, knowing both the cause and effect, we may more intelligently and earnestly strive to prevent them. Though both of these lesions and their morbid sequences often co-exist in the same person, each then rendering the effects of the other more marked, it is better that we study the effects of each separately.

1. *Etiology and Pathology of Cervical Laceration.*

In speaking of *laceration* of the cervix we mean a traumatic division of the lips of the intravaginal portion, involving a part or all of its tissues. The traumatic agency which produces this laceration may be always represented by the presenting part of the child, usually the head, which, being rapidly forced through the yet imperfectly dilated cervical canal, is the cause, in the great majority of cases, of the tear. Premature escape of the liquor amnii before the cervix has become dilated, softened, and retracted over the presenting part, and, especially, unusually severe and prolonged contractions of the uterus by which the child is forced rapidly through the cervical canal, are the chief factors in the production of a lacerated cervix. Other conditions which possess a more or less important causative influence on its production are rigidity of the os; conical cervix; cicatricial induration and hyperplasia from previous disease; cystic disease of the cervix, rendering it non-elastic and friable; flexion of the uterus, causing the expul-

sive force to be directed more against one lip than the other; previous cellulitic adhesions and contractions which may prevent equal dilatation of the lower segment of the uterus, and occasionally the unduly forcible introduction of the hand of the operator or of instruments into the uterine cavity. That it can be and is, in a certain number of cases, produced by the unskilled and careless use of the obstetrical forceps, in rapidly extracting the head before dilatation is sufficiently advanced, cannot be denied, and in these cases the blame of its occurrence should rest upon the operator. I am confident, however, that the number of lacerations produced by the forceps is exceedingly small in proportion to the whole number of lacerations or even of forceps operations, for an experienced operator may even prevent a rupture of cervix and perinæum by gently and gradually evolving the head and regulating its progress with this instrument.

All fissures of the cervix which produce pathological symptoms or changes are the result of parturition. Instances where the cervix has remained fissured, so as to demand subsequent operative treatment, after its division for sterility or dysmenorrhœa are so very rare as to require no notice in this connection, it being a well-known clinical fact that a slit in a non-parturient cervix can with difficulty be prevented from closing, so that a repetition of the division is frequently required.

Laceration of the cervix is especially liable to occur during premature deliveries, on account of the unprepared condition of the cervix and lower uterine segment for its normal function of dilatation at term. Even as early as the second month, when the elastic ovum seems hardly capable of producing such an injury, laceration may occur, and has been reported by many gynecologists, I myself having seen several such cases.

Since the etiological causes above described are most likely to be present during a first confinement, it is manifest that the larger proportion of lacerations occur then, though if the lesion is not discovered until the woman has borne several children it may be impossible to say when it happened, for it is possible that the cervix, like the perinæum, may escape at the first and be torn at a subsequent labor. The first proposition, however, that the laceration is most likely to occur at the first delivery, is sustained by practical experience.

When the cervix has been lacerated to any considerable extent, and the wound has not healed at once, for the reasons given in the first paragraph, the uterus remains hyperæmic, and instead of resuming practically its antegravid shape, size and histological condition, remains larger, heavier, more succulent, its mucous lining pulpy and hyper-secreting, its peritoneal covering hyperæsthetic. In time the irritation and hyperæmia constantly present lead to the formation of new connective tissue, the condition of subinvolution changes to that of hyperplasia, the succulent tissue becomes dense, hard and anæmic, the terminal nerve filaments are compressed by the firm, dense, newly-formed tissue, and the protean neurotic affections, the hystero-neuroses, appear.

The uterine appendages have also felt the malign influence extending from

the hyperæmic cervix, and the same congestion and imperfect involution is shown in the relaxed ligaments, œdematous cellular tissue, and enlarged and tender ovaries, and more, the weakened and relaxed ligaments are unable to support the heavy uterus, which sinks toward the posterior vaginal wall while the fundus tends to fall backward; the ovaries, after falling from their normal position, change their hyperæmia to hyperplasia, and the slightest accidental impulse may, and often does, light up an inflammatory process in any of the peri-uterine tissues.[1]

In addition to these changes in the uterus and its adnexa the cervix itself undergoes alterations of almost equal importance. The lacerated lips become glazed over by cicatricial tissue, which occludes the orifices of the cervical glands, with consequent retention of their contents and swelling of the cervix by their distention (cystic hyperplasia). The cicatrix, especially that in the upper angle of the rent, compresses the terminal nerve filaments which it involves, and through communication with the sympathetic system produces reflex neuroses in various parts of the body.[2] The relation between some of these neuroses and the laceration is so mysterious as to be inexplicable, and is not credited by many gynecologists, but as numerous cases are on record in which the repair of the laceration by a plastic operation has secured a cure of the neurosis, this relation would seem to have been proved in such instances. These neuroses may be either of a physical or mental character, from a simple neuralgia to a chorea, general anæmia, or functional dementia.

If the lacerated cervix does not cicatrize over, or only the angles of the rent heal, the remainder of the lips may undergo cystic or papillary hyperplasia, or both; the separated lips evert, drawn apart by the natural tendency of the flaps of a divided elastic tube to separate when its circular fibres are divided, and, chiefly, by the traction exerted on either lip by the attachment of the various organs adjacent to the part when the patient is in the erect position, and the mucous membrane lining the cavity of the cervix is rolled out (ectropium). This eversion, in the minor degrees of laceration is but slight, but when the rent extends to the vaginal junction and is bilateral, the whole cervical canal, to the internal os, may be laid bare and the tips of the everted lips may touch the vaginal walls. If the laceration is unilateral the ectropium is usually much less, though even then the cervical canal may be laid bare to above the vaginal junction.

In consequence of the chronic passive hyperæmia of the part, maintained by the irritation of the tear, and the cicatricial interference with the normal discharge of mucus from the cervical glands, there is a hyperplasia of all the elements of the cervix, which becomes decidedly, oftentimes enormously, enlarged. The exposed mucous membrane of the cervical canal becomes

[1] Ovaritis and cellulitis are frequently found in connection with and probably depending on the laceration. The cellulitis or peritonitis may have occurred immediately after the injury, and thus are probably to be explained those cases in which the rent has extended into or through the vaginal vault, and the cervix is found bound down by cellulitic exudation, or is drawn to one side by the contraction of effused lymph.

[2] "Minor Surgical Gynecology." Mundé, N. Y., 1885, p. 442.

thickened, granulations spring up, and the glands develop into mucous polypi. By friction against the vaginal walls during walking, through coition, and the softening of the epithelium of the diseased part by the constant discharge, a raw, eroded surface soon forms, on which the swollen papillæ and distended follicles are clearly visible, and from this erosion oozes a profuse, serous fluid, which mingles with the thick, glairy, discolored mucus discharged in abundance from the gaping cervical canal. The appearance of such a swollen, hyperæmic, and eroded cervix with its everted lips studded with papillary excrescences, may so closely resemble epithelioma as to compel even the experienced specialist to call the microscope to his aid in deciding between the two affections. A hyperæmic and hyperplastic condition often extends upward to and even beyond the internal os, with resulting cervical and corporeal endometritis, the latter frequently complicated by the formation of vegetations. In consequence, we have menorrhagia, at times so profuse as to endanger the life of the patient. Profuse menstruation also often occurs, merely from the subinvolution, when no vegetations are present.

It will be readily understood that the various irritations to which the gaping cervical canal is exposed soon develop a hypersecretion of that part, which increases as the glands become hyperplastic and the cervical endometrium more and more rolled out. A profuse catarrhal endotrachelitis is therefore the natural accompaniment of many cases of cervical laceration, and often its only troublesome symptom. In a rather small proportion of cases the catarrh exists without any ectropium of the cervical lining, and I am inclined to attribute the hypersecretion to a subinvolution of the cervical glands after the last confinement. Indeed, I believe this subinvolution, due in itself to the laceration, to be part cause of the chronic endotrachelitis in many cases, even before the subsequent cystic hyperplasia develops. I believe that laceration and cervical catarrh hold the relation to each other of cause and effect, in spite of the view expressed by some prominent authors that the tear occurs because the cervix is degenerated and softened by the hypersecretion. If the latter view were correct, laceration should be less frequent, for chronic catarrh of the cervix in the nullipara is not a very common disease.

Another, not so very rare ultimate result, is the degeneration of the raw, hyperplastic, everted surface of the torn cervix into malignant disease. Cases are constantly occurring where, in carcinoma of the cervix, the original existence of a deep laceration can be recognized. I have observed many cases of this kind, and the inference of cause and effect is irresistible. How many cases have been neglected or cauterized for months, only to terminate finally in carcinoma, we can but conjecture, and rejoice in the possession of instruments and knowledge which now enable us to diagnose and repair this injury[1] before it is too late.

When no eversion of the torn lips takes place, we may still have sub-

[1] Mundé, *Loc. cit.*

involution, cervical catarrh, and reflex neuroses; but usually the local and general effects of the laceration are much less marked than when the lips are everted. In a certain proportion of cases laceration of the cervix produces neither subinvolution nor any of the results above described, and therefore, requires no treatment; and it is equally true that subinvolution, ovaritis, chronic cellulitis, cystic and papillary hyperplasia of the cervical endometrium, endometritis, etc., may occur from other causes, but, occurring together with a laceration, it is generally fair to assume that they depend upon it.

There are still two conditions which, appearing only at certain times, have not yet been described. These are incapacity for conception, or absolute sterility; and its converse, the tendency to abortion, or virtual sterility. It may seem at first sight a curious fact that these two conditions should result from the same pathological process, the laceration, on the one hand forbidding conception, on the other facilitating it, by means of the unusual gaping of the cervical canal. The explanation is easy when we consider the changes subsequent to the lesion and their consequences. The thick, semi-purulent mucus discharged by the hyperplastic glands in the cervical canal virtually plugs the passage and prevents the entrance of the spermatozoa, or washes them away if they have succeeded in gaining a foothold. Besides, the purulent corporeal secretion may interfere with their vitality, and the hyperplastic endometrium may oppose a mechanical barrier to the upward progress of the spermatozoa, or afford a poor soil for the nidation of the ovum. Or, granting that the cervical canal is found free from mucus, as no doubt often happens, and the other obstacles fail, conception takes place, the ovum develops, and gradually expands the cavity of the corpus uteri. The absolute sterility has been overcome and the woman is pregnant! Now steps in the laceration again, to destroy her hopes. As the uterine cavity expands, the organ assumes a spherical shape, with a short, broad, flattened cervix attached to its lower segment; the cervical canal is practically effaced, the internal os, in lacerations of the third degree, is immediately continuous with and contiguous to the vaginal tube, and its tissues are therefore directly exposed to the irritation of friction against the vaginal walls, and the injury so liable to be inflicted by coition. The result of these factors is that the internal os gradually opens, a slight hemorrhage from the endometrium takes place, uterine contraction sets in, and the ovum is expelled. This train of events may occur again and again, the patient becoming each time more and more of an invalid and less capable of reproduction. While these results frequently follow, there are numerous instances where women with extensive lacerations not only conceive readily but carry their children to term, are easily delivered, and make good recoveries. These seeming contradictions, together with many other of the hidden factors of sterility and conception, belong, as yet, to the mysteries of nature.

Another condition which is frequently present as a result of laceration is dyspareunia, the reasons for which will be readily attributed to the patho-

logical changes already described. Painful coition will naturally increase the chances against conception, since that act will probably be less frequently and perfectly performed.

The diagnosis of cervical laceration immediately after labor is unsatisfactory and difficult; the finger introduced in the vagina finds the cervix soft and flabby, and oftentimes, if not expert, is not even able to distinguish it from among the surrounding folds and flabbiness. The extent of a laceration also is very apt to be much over-estimated, a tear which after a month or two will be insignificant and need no treatment, often appearing very large.

With a speculum—the largest Sims, or bivalve—these difficulties are to a certain extent overcome, for we can judge more accurately of the extent of a cervical lesion by sight than by touch. It is very seldom justifiable, however, to make a specular examination immediately after labor, on account of the probable exhaustion of the patient, the difficulty or impossibility of getting sufficient light, the difficulty of exposing the cervix amidst the surrounding flabbiness, and the natural reluctance and repugnance of physician and patient to propose or submit to the ordeal. For these reasons it is a rare thing for me to make a specular examination immediately after delivery. Almost the only condition which imperatively demands it is persistent arterial hemorrhage from a cervical artery; in which case the artery can be tied or the laceration closed, the sutures, of silver, being passed precisely as in the secondary operation (described in all modern text-books on gynecology[1]), and allowed to remain in situ for from eight to ten days, or even longer. I do not think that the immediate suture of a lacerated cervix is justifiable under any other circumstance than the one just mentioned, persistent hemorrhage, a most material objection to the immediate closure being the interference with that free discharge of the lochia which is so essential, both as lessening the danger of septic absorption and promoting involution. While this in itself is a sufficient contra-indication to the immediate operation, a primarily large rent often heals spontaneously, or contracts so much by cicatrization, after a few months, that it becomes insignificant, produces no evil symptoms and requires no operation.

At the end of a month, when the diagnosis can always be easily made, it is advisable to examine and satisfy one's self of the condition of affairs, and determine whether a rent is present which might require a secondary operation.

Such secondary operation may be done at any time after six or eight weeks, though when undertaken too early, before sufficient involution has occurred, and while the uterus is still very succulent and hyperæmic, it is more apt to fail than when done later.

2. *Etiology and Pathology of Perineal Laceration:*—

While the etiological factors in perineal, as in cervical, laceration may with proper care be so reduced that the number of unavoidable lacerations

[1] Mundé, *Loc. cit.*

is but small, still there are conditions which may render the most skilled care ineffective in preventing the tear. In this latter class would belong unusual rigidity of the perineal structures, as met with in primiparæ over thirty years of age; unusual size of the child's head; persistent occipito-posterior positions; want of development of the maternal soft parts; low and narrow pubic arch; a friable and weak state of the perineal tissues, so that they may part like wet paper under very slight pressure, which may occur without any appreciable reason, or be caused by the inflammatory exudation following a too prolonged second stage, or the infiltration of chronic œdema, or of condylomata, or specific ulcerations, or marked varicosity of the veins of the perineal region.

Preventable lacerations are usually caused by the too rapid or forcible delivery of the head or shoulders through structures not yet prepared for so great dilatation. Complete lacerations, which should never occur except under the rarest conditions, are usually caused by the precipitous extraction of the head by the forceps in the hands of an unskilled or very excited operator.

The best means of dilating a rigid perinæum is the slow advance of the fœtal head, and by properly regulating this advance the number of lacerations which may be called wholly unavoidable is made comparatively small, though when the patient, partially anæsthetized or not, becomes unmanageable, and the pains spasmodic at the critical period when the head passes the perinæum, a laceration may occur, even in the hands of the most expert obstetrician.

The method of supporting the perinæum which I have adopted, and which I use with good results, is as follows: When the head bulges the perinæum, and begins to distend it to the extent of safety, I place two fingers, index and middle, of my right hand in the anus, and the thumb upon the child's head, thus placing it very completely under my control, and allowing it to descend or holding it back at my pleasure. After the occiput has escaped well out from under the pubic arch, the head is to be gently, and very slowly, "shelled out," between the pains, by the fingers in the rectum, it being pushed up as close to the symphysis as possible. During this time the patient may be either on the back or side, at the option of the operator; in my opinion the side is preferable, as in that position the woman is less able to bear down, and forcibly expel the head before the perinæum is sufficiently distended. Another good method, with the patient on the side, is to cover the anus with a napkin, and place the palmar surface of the right hand against the perinæum, with the thumb on one side and the fingers on the other, pressing the perinæum upwards or backwards, as may be necessary, and during the passage of the head, keeping it pushed well up towards the symphysis. The other hand passed over the woman and between the thighs —separated by a pillow placed between the knees—assists in pressing the head back. Though this method is a good one, it does not give the operator such complete control of the head as the one first described. When an anæs-

thetic is used, and it is invaluable at this stage, it should be pushed so as to cause marked diminution of the uterine contractions. I cannot refrain from particularly emphasizing, as the result of my experience, that the less hasty the delivery of the head, the less likely is the perinæum to be injured, and in making this statement, I would call attention to the fact, that no danger to the child accrues from the head resting on the perinæum for ten or fifteen minutes, or longer, so long as air has not entered the child's lungs, or the fœtal heart does not show evidence of cranial compression or interference with funic circulation.

The immediate danger from a lacerated perinæum is, that it increases the surfaces from which septic infection may take place; the secondary consequences, described below, are usually much more important and disagreeable. While a slight rent may heal spontaneously, the chances against natural union are in the majority, and this majority increases in a geometrical ratio, as the depth of the tear is greater.

As in laceration of the cervix, so in laceration of the perinæum, and from nearly the same causes, do the contiguous structures, in this latter case the vaginal walls principally, undergo the normal retrograde changes imperfectly, the irritation of the granulating, ununited perinæum causing primarily, as a natural result of the interference with circulation and nutrition, an imperfect and slow involution, and later, from lack of their natural support, a sliding down of the flabby and relaxed vaginal walls together with the contiguous portions of bladder or rectum, one or both, and displacement of the uterus. These changes may take place in two ways:—

1. The posterior vaginal wall, relaxed and subinvoluted—this subinvolution showing itself in the thick, redundant condition, in the hypertrophy of the normal rugæ, and by more or less of a protrusion of the bulb of the urethra, simulating cystocele, and of the posterior wall, simulating rectocele—this redundant, heavy wall, left unsupported by the very factor which caused the condition, the torn perinæum, gradually slides down, and the uterus, deprived thus of its support, little by little, partly tips, partly is drawn backward and downward. Then, usually, the anterior vaginal wall, which has all this time steadily resisted the absence of its natural support in the erect position, the lower part of the posterior vaginal wall and perinæum, is forced down by the varying pressure of the elastic bladder, and drags with it the already partly prolapsed uterus. Thus we have, in natural sequence, rectocele, descensus and retroversion, cystocele, and complete prolapsus uteri.

2. Precisely the same final results are obtained when the changes begin in the anterior vaginal wall, which, deprived of its support, sags down, dragging with it the adjacent portion of the bladder and the uterus. We then have cystocele and descensus with *anteversion* of the uterus. Eventually the posterior vaginal wall begins to prolapse, the uterus is dragged down still more, and the fundus retires in the only direction where it has room, namely, backward, and we get precisely the same condition as in the first instance.

It must not be supposed that we must invariably have all these sequences

of a lacerated perinæum, or inevitably have any of them. Most frequently we find only a rectocele with retroversion and descensus, next a cystocele with descensus, with about equal frequency a rectocele and cystocele with descensus and retroversion, and more rarely a descensus of the first or second degree without prolapse of the vaginal walls, the uterus in this latter case being generally heavy and subinvoluted. In the one case it is a dragging from below, in the other a sinking from above. Why in one instance a rectocele, in another a cystocele, and in a third a combination of these conditions should be the predominating feature, is often difficult to determine.

When, after labor, the cicatrization of the rent takes place, the hyperplastic mucous membrane of the posterior vaginal wall is often drawn down and out by the contraction of the cicatrix, which separates the labia majora and causes the vulvar cleft and vaginal orifice to gape. If, as is frequently the case, the rent has extended some distance up into the vagina, or if it has been slightly lateral, distortion of the posterior vaginal wall and remnant of perinæum may be caused by the cicatrization. The size and shape of the cicatrix may be recognized by its smooth, shiny character, and by the fringes of tissue which often ornament its borders.

In women who have had a number of severe labors, with great over-distention of the perinæum, a condition of that body is frequently met with which practcally corresponds to its destruction by laceration. This condition has been attributed to a diastasis of the muscles from the central tendinous aponeurosis, leaving only the skin and mucous membrane with a little cellular tissue and fat to represent the muscular, firm, elastic perinæum of health.

It is generally safe to assume that the deeper the rent the more certain and distressing the symptoms, particularly the descensus, though cases are occasionally met with where a laceration even to the sphincter is unattended, even after many years, by the least prolapse of either vagina or uterus. This condition can be explained by an exceptional firmness of the vaginal walls and suspensory ligaments, as well as by very perfect involution of the uterus. In complete rupture, even in the worst cases, prolapse of the vagina and uterus is rather the exception than the rule, though rectocele is a common feature. This apparently improbable condition is explained by the fact that in these very bad ruptures there is usually plastic infiltration into the peri-uterine cellular tissue or the broad ligaments, the heritage of previous inflammation, or there is cicatricial induration of the vaginal wall, which prevents descensus, or the cicatricial retraction of the anal sphincter and posterior vaginal walls may act as a barrier to prevent the protrusion.

When there is true or false rectocele the labia majora are separated when the patient is erect, and if there be a firm cicatrix at the site of the tear this separation is constant, whatever may be her position. I have known even slight partial laceration to produce this effect where the cicatrix happened to be very broad. The vaginal orifice being thus made to gape, the vaginal tube is more or less exposed to the entrance of air and dust, the result of

which is a profuse irritating discharge which excoriates those parts with which it comes in contact.

Retention of air in the vagina—garrulitas vulvæ—while the patient is in the recumbent position, or when she happens to stoop forward, and its expulsion with an audible noise when a position is resumed which allows the intra-abdominal pressure to again assert itself, is a very unpleasant if not serious consequence of this vulvar gaping, and may cause great annoyance to the woman if she happens to be in the presence of others, who, of course, imagine the flatus to come from the rectum, its usual source.

Another result of the cicatricial covering of the posterior commissure and the gaping of the vulva is *painful*—where the penis rubs against the tender scar—or *unsatisfactory coition*, the separated labia and gaping orifice diminishing the friction necessary to perfect intercourse. In the one case the sexual act is dreaded by the wife, in the other not enjoyed by the husband. As a consequence of these two forms of dyspareunia, and especially because of the non-retention of the semen in the vagina after intercourse, in a certain proportion of cases of lacerated perinæum we find sterility. To understand how it is that the absence of the perinæum may produce this condition, we have but to compare the relations of the normal curve of the perinæum, posterior vaginal wall and external os to those existing when the perinæum has been destroyed. Naturally, the cervix dips down into the deepest portion of the vaginal tract, in which, in accordance with the law of gravitation, the semen accumulates after withdrawal of the penis. The external os is thus bathed in the semen, and if impregnation does not occur, it is not for want of opportunity. Sims, who first advanced this theory, called this vaginal pouch the *receptaculum seminis* and the contained semen the *lac seminis*. When the perinæum is destroyed the posterior vaginal wall curves downward toward the anus, and it is obvious that the withdrawal of the penis must be followed by the escape of the semen, and this, indeed, is what patients almost invariably report when they consult a physician for acquired sterility, and the perinæum is found to be absent. While practically the explanation is sustained in many instances, there are more cases in which the perineal laceration is not accompanied by sterility. This may be accounted for by the occurrence of ejaculation directly into the, in these cases often gaping, cervical canal, or by the mysterious fact that no matter what lesion of the genitals they may have, short of complete atresia or absence of the ovaries, nothing seems to prevent a certain proportion of women from becoming pregnant.

In *complete* rupture, though, for reasons already given, we are not so liable to have prolapse of vagina and uterus, we find in addition to the other results above described certain peculiarly distressing features. When the rent extends through the internal sphincter there is absolute incontinence, both of fecal matter and flatus; if only through the external sphincter, solid fæces can almost always be controlled, and often their evacuation also, provided the rectal mucosa be not inflamed and irritable. Flatus is not usually under control when the external sphincter has been completely severed, though partial

fissures, involving only the outer fibres and leaving the inner fibres intact, do not affect the power of retention. In complete rupture retention may be greatly improved by cicatricial contraction of the lower extremity of the rectum or by bands stretching across the fissure. The presence of hæmorrhoids, external or internal, generally aggravates the irritability of the rectum. Many patients with complete rupture are perfectly comfortable and suffer no incontinence, except when diarrhœa sets in or when under mental excitement, when they are liable to an involuntary movement at any time or place. Absolute incontinence is the rule when the laceration extends above the internal sphincter, and women thus afflicted are among the most deplorable objects we can meet, even one with a vesico-vaginal fistula being less of a burden and horror to herself and others.

As a result of the exposure of the lower portion of the rectum, in course of time a catarrhal inflammation sets in, which often extends upward, and colitis, with its attendant severe colic and diarrhœa, intensifies the already miserable condition of the patient.

IX.

PRIMARY PERINEORRHAPHY.

HAVING shown in the previous chapter the manifold and serious pathological sequences which may follow and be caused by a perineal laceration, it remains for me to show how most of these evils may be prevented in a large majority of the cases by a means which should be—though not described in works on midwifery—recognized and employed by every practitioner of the obstetric art, that is, the immediate closure of the rent.

To render a description of this procedure intelligible, it is necessary to premise it with some general considerations of the lesion.

There are three varieties of perineal laceration, *partial*, *complete*, and *central*, and of these the first two may each be divided into three degrees, according to the extent of the tear. In the *partial*, the first degree is merely a nick of the fourchette, the second degree is midway to the anus, and the third degree extends to the very edge of the sphincter. (See Fig. 169.) In the *complete*, the first degree extends through the anterior fibres of the sphincter, the second degree one or two inches up the recto-vaginal septum, and the third degree through the internal sphincter. (See Fig. 170.)

I have made these arbitrary divisions because of the marked difference in the significance and gravity of the symptoms produced by each degree of the lesion, and because the distress produced by complete laceration is so markedly out of proportion to that induced by a partial tear.

In partial laceration the mucous membrane of the vaginal orifice, the

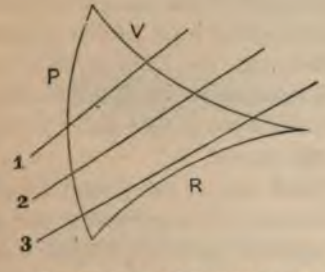
muscular aponeurosis of the perineal muscles, the superficial fascia, the subcutaneous cellular tissue and the skin—the structures constituting the so-called "perineal body"—are torn, while the recto-vaginal septum and sphincter remain intact; the vulval fissure, extended backward, now ends at the point of the external skin at which the rent stops instead of terminating at the fourchette.

In complete rupture the appearance is even more striking and characteristic. In addition to what has just been described, a more or less deep notch appears in place of the anterior arch of the sphincter ani, and through this notch, if the rent be a deep one, the scarlet mucous membrane of the rectum may be seen.

Partial ruptures of the first degree occur in about three-fourths of all primiparæ, and in the second and third degrees, in about one-fourth. Complete perineal rupture is, fortunately, not so common, and is usually caused by the precipitous extraction of the head by the forceps.

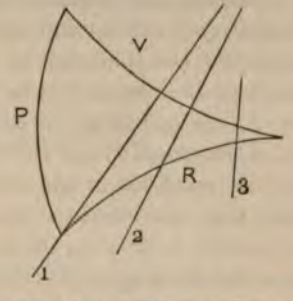
While partial ruptures can, in many cases, be avoided, yet often they will

Fig. 169.



Showing degrees of Partial Laceration. (P. F. M.)

Fig. 170.



Showing degrees of Complete Laceration. (P. F. M.)

occur in spite of the most skilled and complete precautions. I have made the statement before, that if all lacerations of the perinæum of more than the first degree were repaired immediately after their occurrence, the cases coming under the care of the gynæcologist for the secondary operation would be less than a quarter of the number now met with. While a certain proportion (nearly a third in hospitals, less in private practice) of these primary operations must be failures, and while it occasionally happens that even a deep tear unites with no other treatment than a binder about the knees to keep the legs together, yet union after the primary operation is the rule, and union without operation the exception. While some practitioners claim "never to have had a lacerated perinæum in a practice of many years," probably because they failed to look for it or to recognize its existence, and others are too timid to acknowledge that the tear has occurred, there are still a few who are so illogical as to claim, as septic material might be included in the wound, and so removed from disinfection (*sic!*), that the immediate closure

of a perineal wound is dangerous. I admit that there is danger from septic absorption from the constant flowing of the lochia over the open wound, but assert that there is no danger, but much of benefit, resulting from its closure.

There are but two conditions which forbid the immediate closure of any large perineal laceration: when the tear extends so far into the rectum as to render the operation, in the exhausted condition of the patient, too hazardous, and more rarely where there is extreme varicosity of the perineal vessels, so that the sutures, if passed, would necessarily traverse large veins, causing troublesome hemorrhage, and probably subsequent suppuration. In any case, if the rent cannot be closed within six or eight hours after delivery its operative treatment had better be deferred until cicatrization is complete, for while the results of *immediate* closure are so good, success is the exception when the operation is undertaken fifteen to twenty-four hours after labor.

Diagnosis.—After every labor, but especially in a primipara, the perinæum should be examined between a finger in the rectum and the thumb in the vagina, and the existence and depth of any rent noted. If a laceration is found, the knowledge obtained by the finger should be verified by thoroughly cleansing and exposing the vulva to a good light, when the labia may be separated and the full extent and depth of the tear, and whether or not it involves the sphincter or posterior vaginal wall, readily ascertained. The length of the rent should be estimated with the labia in their natural position of approximation, for it must be remembered that the swollen, discolored, gaping condition of the vulva at this time is very liable to give one a magnified impression of the extent of the lesion.

Having now found that the rent is at least one of the second degree, and that, as is usual, it involves the whole thickness of the perinæum, the care of the uterus should be given to the nurse, and the patient's friends being informed of the tear—the possibility of which should always be carefully impressed upon them in every primiparous labor—the instruments should be made ready in an adjoining room.

Instruments.—The needle should be stout, three and a half inches long, with bilateral cutting edges, and curved so that from point to head the distance is but two and a half inches. The needle-holder may be the small one from your pocket-case, which I have always found efficient, or a larger one, if you prefer it. While you may use ordinary twisted silk for your sutures, the No. 2 braided silk cord made by Archibald Turner & Co. is much to be preferred; whatever is used should be dipped, at the time, in a 5% solution of carbolic acid, or a 1–1000 solution of corrosive sublimate, and should be long enough for all the sutures that will probably be used. While this is all the armamentarium necessary when silk is used for the suture, there are some who prefer and use silver, and when this is used a slightly more elaborate outfit is necessary. I wish to have it distinctly understood that my preference is always for silk, in the primary operation, as it is easier to use,

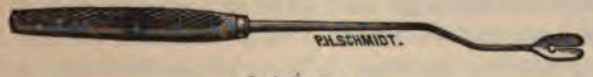
requires fewer instruments, and has no projecting ends which are liable to scratch the patient, and which interfere with the proper cleansing of the external genitals from the lochial secretions; however, as many eminent authorities use and prefer silver, a description of the manner of its use will be included. The size of the silver wire for primary perineorrhaphy should be No. 26 or 27, and it should be so pure and malleable that it will not snap when tightly twisted. Wire sutures should be cut from ten to twelve inches long, so as to allow for loose twisting and handling before the final twisting, and may be here, contrary to the general rule with wire, threaded directly into the needle. To fasten these sutures we need the twister, shield, and crutch.

Operation.—When all is ready, proceed to the bedside of the patient and quietly inform her that she is slightly torn, and that a stitch or two, which will not hurt much, will be required, to close the rent. With a small tear

FIG. 171.

WIRE-TWISTER.—(*P. F. M.*)

FIG. 172.



SIM'S SHIELD.

FIG. 173.

"CRUTCH" FOR BENDING ANGLES IN WIRE SUTURES.

and a moderately plucky patient no anæsthetic is necessary; but if she is nervous and objects, or if the rent is large, let the nurse give her a few whiffs of chloroform on a folded handkerchief, all the time keeping her hand on and rubbing the fundus uteri. As soon as practicable turn the patient crosswise in bed and bring the hips well on to the edge of the bed, where the assistant, if strong enough, can lift both limbs, with flexed knees and thighs, into the gluteo-dorsal position, or the right thigh can be supported by the assistant while the operator manages to control the left with his body. Now compress the uterus firmly, in order to expel any coagula or fluid blood which it may contain, and again entrust its care to the nurse. A disinfectant sponge or wad of absorbent cotton, about the size of an apple—not larger, or it would be difficult to remove later on—is now placed in the vagina, to absorb any blood and prevent its soiling the wound.

Now, if both thighs are held, seat yourself directly in front, where you will have unobstructed approach to the vulva; if only the right thigh is

supported, take your place outside of the left thigh of the patient, supporting it yourself. In either case—being right-handed—pass the index-finger of the left hand into the rectum as a guide, and insert the point of the large needle—firmly grasped in the needle holder—about one-fourth of an inch to the right of the bottom of the rent, and with a quick sweep carry it completely under the rent, emerging at a corresponding spot on the left side. The second suture is passed in precisely the same way, about half an inch above the first, and so on, until the fourchette is reached, where the uppermost suture must lie. While particular care must be taken not to allow any suture to escape from the tissues during any part of its course, and to have them all outside of and under any rents which there may be in the vaginal wall, such as are most likely to occur along the ascending rami of the ischia, it is especially important that the uppermost suture be very carefully placed; this should run, as nearly as possible, around the whole upper edge of the wound, or even slightly above it, and, if properly placed, will close the tear so completely when fastened that—as was first advocated by Alloway, of Montreal—in lacerations of moderate degree no other suture may be necessary.

Having inserted all the sutures, a partial rent of the third degree rarely requiring more than four, the wound should be thoroughly but gently cleansed, and beginning with the lowest, the stitches of silk are tied with the knot slightly to one side, until the uppermost is reached, when the sponge or cotton is removed, and the last knot tied. The ends are cut off about a quarter of an inch from the knot. If silver sutures have been used we begin as before, below, and the other sutures being held out of the way, the ends of the first, and of the others in succession, are crossed a little to one side of the wound and given a couple of twists to hold them temporarily. Then beginning again below, the ends of each in succession are seized by the twister about three inches from the wound, the projecting ends cut off close to the twister to get them out of the way, and the shield having been pressed over them at their intersection, they are twisted until the angle formed by their divergence can no longer be seen through the opening in the shield. When all are twisted, the ends, to keep them from scratching the patient's thighs and to facilitate removal, may be secured in a bit of rubber tubing about one-fourth of an inch long.

If there be rents in the vaginal wall above the perinæum it is well to sew them with a small needle and catgut before we unite the tear in the latter.

Fortunately complete rents are rare. I have had but one opportunity to close one immediately after its occurrence, and in that case I proceeded just as I have already related, the slight tear in the sphincter being included in my first stitch, and union being obtained by first intention.

In complete laceration involving the septum, I should first unite the rent in the latter, knotting the stitches in the rectum and cutting them short with the intention of leaving them to be absorbed or to cut themselves out, and then should proceed as in a partial laceration, using silver sutures.

The suturing having been finished, the parts should be washed clean, dusted with iodoform—if you use it—a piece of lint placed on either side of the stitches, if silver is used, and the patient's knees loosely tied together.

After-treatment.—The knees should be kept loosely bandaged together until a day or two after the removal of the stitches. So long as the lochia remains sweet no vaginal injection is necessary, though the external surface of the perinæum should be irrigated with an antiseptic solution several times a day; in these cases the occlusion bandage is especially useful. Vaginal douches may be carefully used, under the conditions already mentioned (p. 1136), but not otherwise.

The urine has, usually, to be drawn, this being done about every six hours, the urethra being exposed by very gently separating the nymphæ, and the vestibule carefully cleansed before inserting the catheter, so that blood or lochia may not be carried into the bladder. If the patient can urinate herself, I usually permit it after about twelve hours, as no harm can happen to the wound, if it be well closed, by allowing the urine to flow over the skin of the perinæum. Some of my best results have been obtained where no catheter was used.

The bowels having been thoroughly evacuated before labor, can be left alone for three or four days, unless they manifest a desire to move sooner, when an enema of soapsuds with warm water and sweet oil should be given, to insure a soft (not fluid) movement. If there has been no desire up to the evening of the third day a mild laxative should be given, and, at the first sign of an impending stool, the above enema.

It should be remembered that it is imperative that the passage should be soft and smooth, absolutely without scybalæ and unattended by pain, and that *straining* must be avoided. Next in danger to the newly united perinæum to a hard passage with straining, is a diarrhœa with straining. In case of need, capsules of oxgall (gr. v each) may be given every three hours for twenty-four hours, and be followed by an enema of equal parts of fresh gall and soapsuds, or of an ounce of glycerite of oxgall in a pint of warm water, to soften any concretions. If a thick, putty-like accumulation is found in the rectum, the nurse, or preferably the physician himself, must break it up and remove it with the fingers. Unless the nurse is in the highest degree reliable, the operator will always do well to attend to this first movement of the bowels himself, as it is then that the danger of re-laceration or non-union presents itself, even though the stitches are still *in situ*.

The diet should be the same as usual after labor: light but nutritious, an excess of milk being avoided until after the bowels have moved, as it is apt to produce scybalæ.

Removal of Sutures.—The sutures, if of silk, should be removed on the fifth day, the bowels having been thoroughly moved the day before. If silver has been used, the stitches should be allowed to remain in situ until the

eighth day. To remove the stitches the patient may be put in the same position as when the operation was done, except that the legs are to be kept nearly in apposition, and are held over the head of the operator, with legs and thighs flexed at a right angle; or, and I think preferably, we may place the patient on her side, in Sim's position. The parts having been carefully cleansed, we begin with the lowest suture, drawing on it slightly, and cutting it between the knot and skin, removing it by gentle traction *over* the line of incision. With silver sutures we liberate them from the rubber-tubing by cutting them all with one stroke of the scissors. Then the lowest wire is seized with a dressing forceps and gently drawn upon until the shining silver of its loop becomes visible close to the twisted portion; this is cut, and the suture gently withdrawn, the line of traction being *over* the line of union, that is, toward the side on which the wire was cut. Thus the sutures are successively removed, the left hand approximating the nates to lessen any possible tension. It is seldom necessary to leave in any sutures to be removed later, for by the eighth day either the parts will have healed or the operation will have failed. Care should be taken not to cut off the shaft of the suture at its very base, which accident may easily happen when a suture is deeply imbedded. If this should occur, it is almost useless, at the time, to seek for the hidden wire, though, of course, the attempt should be made, always remembering that too much manipulation will do more harm than leaving the suture longer until perfectly solid union has taken place.

After removing the stitches, the legs are again bound together as before for three or four days. The bowels should not be moved sooner than twenty-four hours after the removal of the stitches, and then with the precautions already mentioned. Afterward the bowels should be kept regular, and the perinæum greased with vaseline, to prevent possible cracking of the fresh cicatrix.

If union has not been obtained there is nothing to be done but to wait until complete cicatrization and involution have occurred, and then, if necessary, do the secondary operation,[1] a description of which may be found in most modern text-books on gynæcology.

Pathological Sequences of Primary Perineorrhaphy.—While in itself this operation rarely causes any increased danger to the patient, but rather lessens the risk of septic absorption, by shutting off the torn surfaces from contact with the vaginal secretions, yet, like any other wound, it is exposed to the accidents of inflammation, suppuration, and septic infection.

Œdema of the parts and inflammation along the suture tracks is not so very uncommon, and may be caused by the bruising of the tissues during the passage of the head, by too many and too *tight* sutures, or by the inclusion of blood in a pocket in the wound when the wires have not been kept well under the raw surface. If the inflammatory œdema of the wound is but moderate, nothing is required but the application of some evaporating lotion

[1] Mundé: *loc. cit.*

or vaseline strips; where it is excessive it may require the entire removal of the sutures, or the wire loops may be cut and the suture left in for several days longer, as a sort of a splint. Œdema of the tissues about the anus, which is often a source of great annoyance to the patient, may often be relieved by an ice poultice for forty-eight hours, or, if the swelling persist, by cutting the suture nearest the anus.

Extreme care in cleansing the wound of coagula, and in coaptating its surface so as to avoid the formation of pockets, and the observance of thorough antisepsis (cleanliness) in everything pertaining to the operation, are the surest means of preventing septic infection. Where inflammatory reaction occurs and pus forms in the wound, making its presence known by rigors and rise of temperature, and tenderness and bogginess of the wound, it calls at once for the removal of the sutures and disinfection of the raw surfaces. Of course, if any symptoms of puerperal septicæmia arise which necessitate the passage of the hand into the vagina the stitches have to go, though in any other case, where septic symptoms can be shown not to proceed from the perinæum, there is no reason why they should not remain.

X

THE DIAGNOSIS AND TREATMENT OF EXTRA-UTERINE PREGNANCY.

The subject of the diagnosis and treatment of extra-uterine gestation is one the interest and importance of which no one can deny. The condition, though comparatively rare, is one that we all may meet with, and that most unexpectedly, so that it should be of vital necessity to all to be conversant with what is known concerning the symptoms and conditions that may lead us to suspect its existence, to be able to make that suspicion certainty, and to know that we have at our command an agent that can at once arrest the growth of the misplaced ovum, and with equal certainty sweep aside the threatening death from the mother.

Unfortunately for the victims of ectopic fœtation, our warning of its existence may come only with its fatal ending, and the signs and symptoms which may tell us of its presence are often vague and indefinite; still, enough has now been learned to make its diagnosis more frequent and more a matter of certainty.

Its etiology and varieties, progress and termination have already been discussed in the body of this work (see page 585), so that a slight recapitulation of these heads is all that is here necessary.

In its etiology many points are well known, while others are but matters of hypothesis. We most often find the condition associated with previous

sterility or pelvic inflammations, or conditions which have altered in some way the normal relations of the uterus, tubes and ovaries, while again we may meet it where we have no history which could lead us to suspect its advent.

Elaborate subdivisions of its varieties have been made and verified, on paper or at the necropsy, but for our practical consideration we need only three—tubal, abdominal and ovarian—with, perhaps, occasionally, two of these combined. The relative frequency of these we find, by taking the average of a large number of cases, to be about fifty-two (52 %) per cent. abdominal, forty-two (42 %) per cent. tubal, and six (6 %) per cent. ovarian, of which about thirty-seven (37%) per cent. occur between puberty and twenty, more than fifty (50%) per cent. between twenty and thirty, and nearly twelve (12%) per cent. in the years following.

In their progress and termination the three varieties vary in many important respects; while all may rupture, with probable fatal result, at any time after their inception, the tubal and ovarian, growing in comparatively non-distensible structures, rarely reach a development of more than three or four months before rupture. Cases have been reported by Ellwood Wilson, Graham, Schwarz, myself and others, where a tubal or tubo-uterine gestation has been spontaneously expelled through the vagina at a period between the third and fourth months,[1] and in the well-known case of tubo-uterine gestation of Lenox Hodge labor was induced at the eighth month by dilatation of the os uteri, the septum was scratched through which separated the ovum from the uterus, and the child and placenta were easily and successfully delivered. Such favorable terminations are, however, very rare. The abdominal form—the least dangerous—may begin *ab initio* as such, or may result from the rupture of the containing sac and discharge of the ovum in one of the other forms of extra-uterine pregnancy, the dispossessed germ attaching itself where it may fall. The pregnancy in this case may go on to full term, and then rupture during the pseudo-labor which occurs, or the fœtus, dying in the intact sac, remains innocuous for a variable time, and is then either absorbed or, more often, expelled from the maternal body by the natural processes of inflammation and suppuration, or removal by surgical procedure—the risk to the mother in any case being great. Rarely, a living child may be delivered by laparotomy or elytrotomy.

The mortality attending cases of ectopic fœtation is very great, having been estimated by Parry,[2] in his analysis of five hundred cases, as high as (67.2%) sixty-seven and two-tenths per cent., and later, by Puech,[3] at at least sixty (60%) per cent.

In the future, when electricity shall be the recognized agent in the treatment of these cases, and when diagnosis shall be more certain, this enormous mortality will no longer exist, for we have in the electric current the means to at once, safely and certainly, destroy the fœtus, and with it the principal danger to the mother—the danger of rupture of the cyst.

[1] *Am. Jour. of Obst.*, 1879, pp. 330-378. [2] *Extra-Uterine Preg.*, Parry, Phila., 1876, p. 169.
[3] *Gaz. Obst.*, Paris, 1879, vol. viii, p. 321

SYMPTOMS AND DIAGNOSIS.

Unfortunately for those who suffer from ectopic gestation, its signs and symptoms are extremely irregular and oftentimes misleading, so that men of the highest ability and skill have not seldom arrived at diagnoses far removed from the true condition, the pregnancy only being suspected when the fatal hemorrhage occurred, when laparotomy was done for some other supposed condition, or when necropsy pointed out the misplaced ovum. The testimony of many names high in authority might be cited in this connection, and from among them we will choose that of Lawson Tait, in whose latest published case [1] "the symptoms were those of acute peritonitis, with intense pain, arising, apparently, from a tumor, which could be felt running from the right cornu of the uterus up towards the brim of the pelvis, shaped somewhat like a sausage. Its relations could be made out with great exactness, as the patient was a thin, small woman. It was supposed to be a sloughing myoma at the right cornu of the uterus; for no history could be obtained which in any way suggested tubal pregnancy." Laparotomy was done, and the sloughing myoma was found to be a tubo-uterine (interstitial) pregnancy. The patient made an easy and rapid recovery.

The symptoms given below are seldom all noted in any one case, though generally a fair proportion of them are present. There is usually a history of complete previous sterility, or of sterility following some pelvic inflammation, together with some of the signs of normal pregnancy, as morning nausea, enlargement of the breasts and areola, the presence in the breasts of milk or colostrum, the abdominal tumor.

The symptoms which first direct our attention to the probable state of affairs, are usually pain and menstrual irregularities.

The pain is usually severe, paroxysmal, and accompanied by the constitutional symptoms of anxiety, faintness, and depression. It may be a fixed, grinding pain in one iliac fossa, perhaps shooting down into the thigh; [2] or, it may be a colicky, cramp-like pain anywhere in the lower abdomen. Whichever it may be, it is exceedingly sudden in its appearance and irregular in its recurrence.

It happens in exceptional cases that the fœtal sac ruptures soon after or at the first appearance of the characteristic pain, so that when we are called to the patient we find her prostrated; passing from one fainting spell to another; the respiration sighing, gasping and rapid; the pulse rapid, soft and compressible; the face and extremities deadly pale, pinched, cold, and moist; the expression anxious, perhaps terrified; the mind clear; the abdomen full or even distended, soft, flat, obscurely fluctuant and warm; and often a history that "she felt something give way, and then felt faint;" in fact, all the well known symptoms of concealed abdominal hemorrhage.

While menstruation ceases when the pregnancy begins, we often have irregular, bloody discharges from the uterus, which, to the careless observer, may simulate menstruation, but which are of great diagnostic significance. These

[1] *Brit. Gyn. Jour.*, part ii, p. 178. July, 1885.

[2] Thomas, *Am. Gyn. Trans.*, 1882, p. 233.

metrorrhagiæ may be, as described by Thomas (loc. cit., p. 233), irregular gushes of blood, ceasing and suddenly recurring without assignable cause; or we may have sero-sanguinolent discharges, with or without the expulsion, from an otherwise empty uterus, of shreds of decidual membrane. Though a decidua is probably always formed in the uterus, it does not always become early detached. When we find in the metrorrhagic discharges the decidua in the form of a *closed* sac containing no trace of a fœtus, we have a pathognomonic sign of extra-uterine gestation; this, however, occurs but rarely, the adventitious membrane being usually expelled in shreds (so that this symptom has been mistaken for membranous dysmenorrhœa), or in such a condition of disintegration that its detection is difficult and apt to be overlooked. The microscope may help us, by showing the large, round, decidual cells.

While the foregoing symptoms lead us to suspect the ectopic gestation, its existence can be assured only by physical exploration.

Abdominal palpation may show the presence of a tumor in one or other iliac regions, and in advanced abdominal gestation, where the ectopic sac simulates the gravid womb, we find a valuable sign, described in but few text-books, namely, that when we place the hand on and gently rub the pregnant uterus we feel the intermittent contractions of that organ, these contractions being absent in the extra-uterine cyst. The fœtus, also, can usually be felt much more distinctly than in normal cases, there sometimes seeming to be, from the thinning of the abdominal wall, merely skin between the fœtus and the examining hand. This sign is of considerable import, so that when, in examining a gravid woman, we find this abnormal distinctness of the fœtal parts to the touch, we should always think of the possibility of the pregnancy being extra-uterine.

On *bimanual palpation* we usually discover the uterus to be somewhat enlarged, though the increase in size may be but slight, and at the same time displaced either laterally, or upward and forward; on further palpation we discover a tumor in the situation of either broad ligament or posterior to the uterus, which is tense, elastic, immovable or nearly so, often giving a sense of obscure fluctuation, and vague or even well-marked ballottement, tender to the touch; palpation often bringing on a paroxysm of the cramp-like pains already described. There are also often small or large pulsating vessels in the vaginal walls about the tumor, and, in cases where the fœtus is of a development of several months, we may feel it through the vaginal walls with ease.

Repeated palpation demonstrates the rapid growth of the tumor when compared with that of the uterus. Early in its development, and while it is yet small, the situation of the tumor can generally be made out with some certainty, but its nature is not then so easily ascertained as later, when, on the other hand, it is not generally possible to say with certainty to which of the three forms it belongs, both on account of its size and of the adhesions which it has then formed.

When it is difficult, by ordinary vagino-abdominal palpation, to make sure of the nature or position of the tumor, we may palpate through the rectum, or dilate the urethra and examine with a finger in the bladder, the combined vesico-rectal examination often giving valuable results, or we may use any of these measures with the patient anæsthetized.

When we strongly suspect the existence of ectopic fœtation, though we may disturb a normally implanted or the twin of an extra-uterine ovum, it is not only justifiable, but often necessary, that we should examine the uterus with the sound, as to its length, or dilate the os and with the finger satisfy ourselves of the condition of its interior.

It is not superfluous to say that all these manœuvres should be carried out with care and gentleness, that we may avoid the very termination we wish to prevent, viz., the rupture of the cyst. The passage of the sound or dilatation of the os uteri especially should not be resorted to unnecessarily, for several cases are on record where they have set up contractions of the cyst and uterus which have resulted in rupture.

A review of these symptoms would lead us to infer the probability of extra-uterine gestation when we find—

1. A history of previous sterility or of pelvic inflammation.
2. The presence of some of the signs of normal pregnancy.
3. Symptoms of abortion, without trace of the fœtus.
4. The expulsion of fragments or of an entire decidual membrane.
5. Recurrent attacks of severe cramp-like or grinding pain in the hypogastric or iliac regions.
6. Great and sudden prostration following an attack of pain, with symptoms of internal hemorrhage.

This probability would be made certainty when, on physical examination we found, *per vaginam*—

7. The uterus somewhat enlarged and displaced laterally, or forward and upward.
8. An elastic, fluctuant tumor, on either side or behind the uterus which was
9. Tender to the touch, and in which palpation excited severe pain.
10. By ballottement, a floating body in the tumor.
11. The fœtal parts palpable through the vaginal walls.
12. Pulsating vessels in the vaginal walls near the tumor.

Per abdominem—

13. A tense, fluctuating tumor, possibly giving ballottement.
14. A tumor simulating the gravid uterus, but lacking the rhythmical contractility of that organ.
15. The sound of the fœtal heart.
16. The fœtal parts and movements.

The diagnosis of this condition is not generally difficult after we have once had our attention directed to its possibility. In some cases where the symp-

toms have been present for a certain time, the child dying, they disappear; in cases like this the diagnosis of the nature of the tumor which we find may be difficult or impossible by means of the physical signs, but may suggest itself with some degree of probability through the previous history.

Treatment.—It is a somewhat remarkable fact that the treatment which in this country has been so uniformly successful, and which has been accepted by the profession as that proper for *all* cases of extra-uterine fœtation seen before the end of the fourth month, and for many others at an even later period, should be so little noticed abroad, that it is not even mentioned in most modern foreign text-books.

This treatment, which has proved itself successful in every case in which it has been tried (about thirty-five), is the destruction of the life of the fœtus by the passage of an electrical current through the sac containing it.

Both the galvanic and the faradic currents have been used, and with equal success, each having its partisans and its opponents. Galvanism has been used with a continuous current; an interrupted current; a frequently reversed current; and up to a strength of forty cells (strength in milli-ampères not noted), and though it has in certain cases caused alarming temporary symptoms of collapse, its end has always been attained, the unfavorable symptoms probably being caused by its too strong application.

While, theoretically, galvanism would seem to be much the best form of electricity with which to destroy the life of an ectopic fœtus, faradism has been quite extensively used, and has proved itself just as efficient, while not producing the powerful electrolytic (chemical), physical, and physiological effects which have sometimes caused disagreeable and dangerous symptoms when galvanism has been employed. The effects of the faradic current being largely mechanical, it is not probable that it can do any serious injury when used for the purpose under discussion, even when its current is increased to the limits of the patient's endurance, and the fear that it would excite contraction of the tubal walls strong enough to precipitate a rupture of the cyst has not, thus far, been realized. As the walls of the tubes are but scantily supplied with muscular fibres, the chief danger of cystic rupture would seem to come from the powerful contractions which are apt to be excited in the abdominal muscles; these contractions may, to a certain extent, be rendered less energetic by using a large, flat sponge for the external electrode, so that the current passing to the external pole shall be as diffused as possible.

A possible effect of faradization in *interstitial* fœtation is the arousal of muscular contractions, by which the fœtus is propelled into the uterine cavity, as was done by natural contractions in the cases reported by myself and others. Whether such a propulsion of the fœtus into the uterus from the tube proper is possible, seems, as yet, doubtful. When the fœtus has once been destroyed, and we wish to promote absorption of the dead ovum, the use of faradism will probably not give as good results as will the employment of a moderate continuous galvanic current, the physiological effects of

the latter—the effects on circulation, absorption, and excretion—being much more marked than those of the secondary current.

While I am inclined to favor the use of faradism in the treatment of extra-uterine fœtation—in my opinion it being just as efficient, less dangerous, and more convenient, while the apparatus for its production is less costly and less cumbersome—the question, "what is the best form of electricity to use?" is not yet definitely settled, nor can it be without a much greater experience in the use of its various forms than we now possess. That, however, electricity in some form is the proper treatment is beyond a doubt, so that in any case where the diagnosis of ectopic fœtation has been made, or even only strongly suspected, before the fifth month, it seems, in view of the results obtained, but criminal trifling with the life of the patient to temporize or try other measures of treatment. After the fifth month, when the danger of rupture is not so imminent, it would seem right and proper to allow the gestation to go to term and then to do laparotomy, in the hopes of saving both mother and child.

The general method of the application of electricity should be as follows: The patient should be at home, in bed, with rectum and bladder both empty. We should be prepared for the occurrence of shock, and even for the performance of laparotomy in case of rupture of the cyst, though this latter accident has not yet occurred, and should have at least the means of treating, by hypodermics, hot bottles, etc., the first of these complications. Having any good faradic battery, we need, in addition, a ball electrode of about three-fourths of an inch in diameter, fixed on an insulated staff, for insertion into the rectum or vagina, and a flat sponge electrode for application to the abdomen, with, of course, the necessary conducting cords. Having mapped out the tumor, we place one electrode as closely in apposition to it internally as is possible, passing it for this purpose into rectum or vagina—usually we can do better through the rectum; the other electrode is then placed on the integument of the abdomen, over the tumor, opposite the internal electrode, and a slight current turned on, which is to be gradually increased to as much as the patient can easily bear. The séance should be for about five minutes, and should be repeated daily until there are well marked signs of the death of the fœtus, shown most surely by a diminution in the size and tenseness of the sac, and by the cessation of whatever signs of pregnancy may have been present. Galvanism may be used in the same way, beginning with few cells and gradually increasing the strength, using either a continuous or interrupted current.

The changes showing the death of the fœtus often manifest themselves on even the first day of this treatment, fœtal motion often ceasing after the first sitting; pain and soreness about the tumor disappear in a few days; the breasts become flabby; the sac soon begins to shrink; and after the treatment has been continued for ten or twelve days nearly always shows a marked diminution in size, the continuance of the electricity seeming to markedly hasten this process of its involution.

The following case abstracts are interesting and instructive, as showing both the methods used and the results obtained:—

[1] CASE I.—Case of DR. CHARLES MCBURNEY. Diagnosis of extra-uterine gestation—tubal, left side, third month—confirmed by DRS. THOMAS and T. ADDIS EMMET. On January 3d, 1878, Dr. Rockwell met Drs. Thomas, Emmet, and McBurney, bringing with him a thirty-six cell galvanic battery. A sponge electrode mounted on an insulated handle was passed into the rectum, just under the fœtal ball, and a flat sponge electrode placed on the abdomen over the mass; a gentle current was passed at first, which was increased as the patient became accustomed to it, until, after five minutes, seventeen cells were in circuit. The current was interrupted about 120 times a minute, and, excluding short intervals of rest, the patient was under its influence about three minutes. The current was again passed the next day, using the force of twenty-three cells for three and a half minutes.

After the first application, slight painful contractions were excited in the fœtal envelope, and some tenderness was developed in the abdominal muscles, but neither pulse nor temperature were affected; after the second, decided and very painful contractions came on, so that opium had to be freely used, to quiet suffering. The pulse gradually rose to 112 and the temperature to 101½°. The whole abdomen was tender to pressure, but none of the symptoms were of a character to excite fear of inflammatory trouble. A discharge of blood from the uterus now began, and continued to the end of the case. On the evening of this day (January 4th), it was felt that the death of the fœtus was assured. The symptoms remained the same on the morning of January 5th, the contractions of the tube being very strong and often repeated. Careful palpation at this time showed the uterus non-contractile and quiescent in its normal position, while at its side the larger fœtal shell could be distinctly felt—round and hard. Two hours after this examination the tumor suddenly greatly diminished in size, while the uterus became distended, blood pouring from it freely. Vaginal examination now discovered tense membranes protruding from the os; these were ruptured, and soon a fœtus and placenta were expelled. Examination the next day revealed the uterus somewhat tender, the fœtal sac being also plainly felt, though insignificant in bulk as compared with its former size. Patient made a perfect recovery.

CASE II.—In the practice of DR. C. E. BILLINGTON. Right tubal pregnancy, third month. Diagnosis confirmed by DR. THOMAS, who advised electricity. Galvanism applied by Dr. Rockwell; fifteen cells; rapid interruptions. Repeated three times, on alternate days, though fœtus was probably killed by first application; tumor immediately grew smaller, and in two months had nearly disappeared.

CASE III.—In the practice of DR. BACHE EMMET. Diagnosis confirmed by DRS. THOMAS, and T. A. EMMET. Galvanism by Dr. Rockwell; ten to eighteen cells; rapid interruptions. This treatment, which caused considerable distress, was three times repeated, at intervals of one or two days, and was successful in arresting the pregnancy.

CASE IV.—In the practice of DR. EVERETT HERRICK. Diagnosis confirmed by DRS. THOMAS and EMMET. Galvanism by Dr. Rockwell; one electrode in rectum and one on abdomen; four séances, at twenty-four hour intervals. Extra-uterine mass steadily diminished and entire recovery followed.

CASE V.—In the practice of DR. N. S. WESTCOTT. Diagnosis confirmed by DR. THOMAS, who advised electricity. Normal uterine pregnancy in connection with tubal gestation. One pole was applied to the tumor through the vagina, and the other placed over it externally, and the constant current, rapidly interrupted, of a maximum strength of twenty-four volts, was used by Dr. Rockwell, during three sittings, during and after which the tumor decreased markedly in size. Normal uterine pregnancy not disturbed.

CASE VI.—In the practice of DR. ———. Patient a young, unmarried woman. Nausea and areolar changes. Tubal pregnancy in fourth month. Galvanism by Dr.

[1] *New York Med. Journ.*, vol. xxii, No. 3, and *Med. and Surg. Electricity*, Beard & Rockwell, Fourth Ed., N. Y., 1883, page 606.

Rockwell. On account of the great distention of the tube, the current was passed with great care, with one pole in the rectum and the other externally. A current strength of about sixteen volts was used, beginning mildly, quickly increasing the force without interruption, and allowing it to pass in a continuous stream for a moment, and then repeating the procedure. Two sittings, at interval of twenty-four hours. Tumor began to decrease, and in two weeks was only half its former size; after some months entirely disappeared.

[1] Case VII.—In the practice of Dr. H. Marion Sims. Ectopic fœtation, third month. Diagnosis positively confirmed by Dr. T. A. Emmet. The size of the cyst was such that operation was urged immediately, and for fear that the sac might be ruptured through uncontrollable movements of the patient, Dr. Emmet advised the administration of an anæsthetic. Ether being given, shocks from a galvanic current of but sixteen volts in strength were passed by Dr. Rockwell through the fœtal mass, this mildness of the treatment being necessitated because of the unusual nerve irritability and the violence of the muscular contractions. Though the fœtus was probably destroyed at the first séance, the operation was repeated three times, at intervals of a few days, to ensure absolute certainty of its death, and to aid absorption. The cyst rapidly diminished in size, and the patient in a short time was entirely cured.

Case VIII.—Mundé. The patient consulted me February 6th, 1884, to ascertain whether she was pregnant. Last coition was December 1st, immediately after the cessation of a menstrual period, and since she had not had any show at the times of her periods, but had a slight bloody discharge twice, at irregular intervals. She had increasing nausea and colicky pains in lower abdomen, which were growing worse, and which had for some days produced faintness. There was oozing of colostrum from the nipples on pressure, and areolar changes. The uterus, but slightly enlarged, was pressed somewhat to the left side, the right half of the pelvic cavity being occupied by an oblong, irregular, deeply fluctuating mass, about the size of a goose egg, slightly movable with the uterus. Bimanual palpation of this mass caused intense pain, and brought on the faintness and colicky pains of which the patient had complained. Large pulsating vessels could be felt in the right vaginal pouch. Sound showed the uterus to be three inches in depth. I at once made the diagnosis, and advised the destruction of the fœtus by electricity. To share the responsibility, I proposed a consultation with Dr. T. A. Emmet, who saw the patient the next day, at his office, and not knowing my diagnosis, pronounced it to be a pregnancy of the right tube, and advised galvanism. After this examination the patient had so much pain that I prescribed a morphine suppository, and fearing that delay might result in rupture of the sac I determined to pass the current that very afternoon. At 4 P. M. I found the patient much prostrated, but as I preferred to run the risk of producing a rupture by the electricity rather than let the sac grow even twenty-four hours longer, placing a leather-covered ball electrode in the rectum, and the other pole, a flat sponge, over the mass outside, I passed the current of my newly-filled galvanic battery through the sac, gradually increasing the strength to twenty-four cells and rapidly breaking the current. The sitting lasted about ten minutes, and the shocks were quite painful. I did not think this current too strong, for the same force had been used in McBurney's case. I left the patient feeling fairly comfortable, and no more prostrated than before the application.

Early the next morning I was called, and found that the patient, whose nausea and retching had continued all night, had sat up in bed toward morning, to vomit, had been seized with a violent pain in the abdomen, and had fallen back in a faint. I found her perfectly conscious, features pale, pinched and clammy, pulseless at the wrist, skin and extremities cold. One thing only led me to doubt a rupture of the cyst, and that was the strength with which she could turn about in bed and answer questions. While evi-

[1] See Beard & Rockwell, *loc cit.*, page 603, et seq., for cases I to VII, inclusive.

dently in a state of collapse, the prostration did not seem to me to be exactly like that from hemorrhage. I could not but hope that it might be merely shock from the repeated examinations and the galvanic current through so sensitive an organ as an over-distended tube. I made a gentle vaginal examination, and found the outline of the mass as distinct as the day before. In any case, the only active measure, laparotomy, could not be carried out on a patient in so profound a state of collapse as to be pulseless at the wrists; she would simply have died on the table. Hence, if there was a rupture, all I could do was to stimulate her until she rallied sufficiently to justify laparotomy; and if there was no rupture, then that operation was not indicated. I therefore ordered hypodermics of brandy, each containing five minims of arom. spir. ammonia, one to be given every fifteen minutes, in different parts of the body (the patient's stomach would retain absolutely nothing), sent for a nurse, and went home for my laparotomy instruments, in case at any moment they should be required. The physician who was hurriedly called in, and whom I found at the bedside when I arrived, Dr. Black, of the United States Army, on leave of absence and temporarily residing in the neighborhood, kindly stayed with the patient, and was relieved later by my assistant, Dr. E. H. Grandin. On my return, several hours later, I found the condition unchanged. The hypodermics were continued during the day, some fifty in all being given.

The next morning there was a faint trace of pulsation at the wrist; gradually it increased, and we began to hope; the retching diminished, and the patient could retain cracked ice. Her abdomen was very sore, and she complained a great deal of colicky pains on the right side. To make a long story short, she gradually rallied, began to retain nourishment, and in a week was able to sit up in bed, and in two weeks lie on a lounge. The sac had become somewhat harder, fluctuation was less distinct, pulsation had disappeared, but the mass was not perceptibly smaller. The breasts had become flabby, but they still secreted colostrum. Although there could not be any reasonable doubt of the death of the fœtus after such a series of galvanic shocks, still, to make sure, I thought it best to pass the faradic current through the sac a number of times, and beginning on the sixteenth day after the galvanic sitting, I made six faradic applications to the sac, one pole in the vagina, the other over the mass on the abdomen, using the full strength of a Kidder tip-battery, and frequently breaking the current. One sitting per day was given, lasting about fifteen minutes. This treatment caused no pain or shock whatever. From this time on the patient improved rapidly, regained her flesh and color, and by the end of the fourth week was able to go out. The colostrum gradually disappeared from the breasts, but the sac diminished very slowly, so that when I last saw her at my office, on May 19th, three months and a half after the galvanic shock, it was certainly still two-thirds as large as at first, although perfectly solid. All pain in it had ceased before she was allowed to go out. Menstruation reappeared on April 12th, and again on May 7th, lasting seven days. The uterus was measured and found to be two and three-fourths inches deep. The lady left for Europe on May 21st, in perfect health, and without a complaint of any kind, and is still abroad.

[1] Case IX.—Case of Joshua G. Allen, in 1869. Abdominal pregnancy; fourth month. The tumor was found behind the uterus, which was empty, and five inches in depth. The diagnosis was confirmed by Drs. Agnew and Pepper, the latter of whom examined the patient several times, and ascertained by ballottement the presence of the fœtus. One pole of an ordinary electro-magnetic machine was passed through a glass tubular speculum, and applied to the vaginal portion of the tumor behind the cervix; the other pole was placed over the tumor upon the abdomen. At first a weak current was used, producing no visible impression, but on the third application a powerful cur-

[1] *Am. Journ. of Obst.*, 1872, vol. v, p. 161.

rent was turned on, from which the patient recoiled with considerable fright, declaring that she felt something turning in the abdomen. After this a moderate current was used every three days, for two weeks. The tumor ceased to grow, diminished in size, and ballottement disappeared. Three years after there was still a well defined tumor, the size of a fist, which, however, gave no trouble.

[1] CASE X.—H. G. LANDIS and STARLING LOVING. Left tubo-abdominal pregnancy, of nearly three months' growth. Treatment begun March 20th, 1877, with a Drescher faradic apparatus, one electrode in the vagina, the other on the abdomen. Current of moderate strength used and continued fifty-five minutes, the patient complaining bitterly of its effects, and especially of increased backache. It caused, also, weakness of the pulse, paleness of the surface, and faintness, together with contractions of the uterus and tumor. Electricity was used altogether eight times, at about daily intervals. On the third day of the treatment the pain was intense, but after that there was neither pain nor contractions, and on the fifth day she walked down stairs. Tumor steadily diminished in size, and within a year no trace of it could be discovered.

[2] CASE XI.—LANDIS. Same patient as case X. In robust health until October, 1881, when she became impregnated. Ectopic fœtation suspected but positive diagnosis not made until December 6th, when she was attacked by "the typical and horrible pain of extra-uterine pregnancy." Diagnosis of left tubal-pregnancy in third month, corroborated by Drs. S. Loving and A. Dunlap. At this time, the induced current from a one-cell battery was used for ten minutes, when she felt much easier; this was repeated on the 7th, 8th, 9th, 11th, and 14th, when the current was used fifty-three minutes, and increased to its greatest intensity. No contractions or pain were observed after the 14th. A decidua came away on the 15th. Tumor steadily diminished in size, and gave no further trouble.

[3] CASE XII.—J. C. REEVE. Abdominal pregnancy of three months. On March 28th, 1879, the secondary current of a single cell of a galvano-faradic machine was applied, as strong as the patient could bear it, for ten minutes, one pole being placed on the tumor in the vagina, and the other outside, on the abdomen. This was repeated daily, until April 5th, with no apparent effect, except some increase in the uterine discharge. On April 15th the breasts were somewhat flaccid, the tumor about the same size, but the vessels which had been felt coursing over it were fewer, and their pulsations much less energetic. May 11th, breasts entirely flaccid; no vessels felt on tumor; no more pain; sound which had passed three and a half inches now enters only a little deeper than normal; May 21st, normal menstruation began; June 4th, tumor only one-third its former size; menstruation regular; August 31st, tumor much smaller and less accessible.

[4] CASE XIII.—WILLIAM T. LUSK. Tubal pregnancy of two months. Diagnosis corroborated by DR. THOMAS. The first application was made November 15th, a moderate current from a single cell battery being used, one pole in the vagina and the other on the abdomen. Two days later the tumor had grown larger, more tense and bulged the vaginal wall toward the vulva. The full force of the battery was now applied. The next day the sac felt flaccid, and by the end of the week had lost its regular outline. On the tenth day, the last application was made. The shrinkage at this time had become so unmistakable that no doubt was left as to the death of the embryo. Recovery uninterrupted. When last examined, all that remained of the tumor was a mass the size of an English walnut.

[5] CASE XIV.—H. J. GARRIGUES. Right tubal pregnancy of two months. On March 4th, 1882, faradization was begun, one pole in vagina and one on abdomen; current passed for ten minutes, and gradually increased to limit of endurance, but not

[1] *Ohio Med. and Surg. Journ.*, Oct., 1877.
[2] *Medical News, Phila.*, 1882, vol. xl, page 376.
[3] *Trans. Am. Gyn. Soc.*, vol. iv, p. 313.
[4] *Am. Journ. Obst.*, 1881, p. 333.
[5] *Trans. Am. Gyn. Soc.*, 1882, p. 185.

used strong enough to cause real pain. Between this and March 18th, ten applications were made; the tumor began to diminish on the second day, and it and the symptoms both grew steadily less, the patient only complaining of slight occasional colicky pain on the 13th, and some soreness over the tumor. March 20th, tumor diminished to size of English walnut. Patient well.

[1] CASE XV.—DR. D. C. COCKS and A. J. MCCOSH; DR. THOMAS consulting. Left tubal pregnancy, three months. On March 28th, and eight following days, Dr. Cocks applied a strong faradic current from a Kidder battery, the application lasting seven minutes, one pole being in the rectum, the other on the abdomen. These applications were followed by no perceptible change in the local or general condition of the patient. On April 19th patient was first seen by Dr. McCosh. The tumor then was about as large as two fists, and was exceedingly painful on pressure. With one electrode in the rectum, and the other on the abdomen over the growth, a continuous current from sixteen cells, was passed for five minutes, causing considerable pain; then the current from ten cells, rapidly interrupted for one minute; the pain caused by this, however, was so severe, and the patient became so excited, that it had to be discontinued. The patient at this time had had, for five days, an evening temperature of 100.5° to 101.5°. On the 21st patient was etherized, and the current from twenty cells, interrupted sixty times a minute, was passed for four minutes, and then a continuous current for three minutes; the interruption caused marked contractions of the leg muscles. On the 23d, with patient etherized, the current from twenty cells, with interruptions of thirty to the minute, was passed for four minutes, and then continuously for three minutes. On the 28th, as there was but little change in the tumor or the severity of the pain, the patient was again etherized, and a current from *forty* cells—interruptions sixty to the minute—passed for four minutes, and then the continuous current of the same strength for five minutes. The contractions of the leg and abdominal muscles were very energetic when the current was interrupted. The pains gradually improved after this application of galvanism; the temperature remained normal after May 1st; menstruation appeared May 18th; on September 15th, there was still occasional pain, but the patient had gained decidedly in flesh and strength, and though the tumor was still found, it was much smaller, less tense, and less painful on pressure.

While this case is of a somewhat doubtful nature, it is interesting, on account of the unusually powerful electrical currents employed, they being very much stronger than is usually considered necessary or safe.

[2] CASE XVI.—DR. THOMAS. Abdominal pregnancy; fourth month. January 23d, 1884. Galvanic current, one electrode in rectum, other on abdomen. Seventeen cells—interruption sixty to the minute—for two minutes. Rest of a minute. Then seventeen cells—interrupted—for two minutes. 26th. Twenty cells—interrupted—for two minutes. Rest of a minute, then twenty cells—continuous—for two minutes. 28th. Fourteen cells—interrupted—for three minutes; same—continuous—for three minutes. 29th. Twenty cells—interrupted—for two minutes; same—continuous—for two minutes; same—interrupted—for two minutes.

The results of the electrical treatment were truly remarkable; at the end of forty-eight hours the unpleasant symptoms began rapidly to diminish; at the end of ten days she returned home, though at great risk; at the end of a month resumed, very gradually, her usual avocations, and finally completely recovered; a small, hard nodule, about the size of a hen's egg remaining to mark the site of the large tumor which had occupied Douglas' pouch.

[3] CASE XVII.—DR. BRIGGS. DR. M. D. MANN in consultation. Left tubal pregnancy; end of third month. Electrical treatment begun May 21st. Faradic current,

[1] *Trans. Am. Gyn. Soc.*, 1884, p. 172. [2] *Trans. Am. Gyn. Soc.*, 1884, p. 174.
[3] *Med. News*, Phila., July 11th, 1885, p. 31.

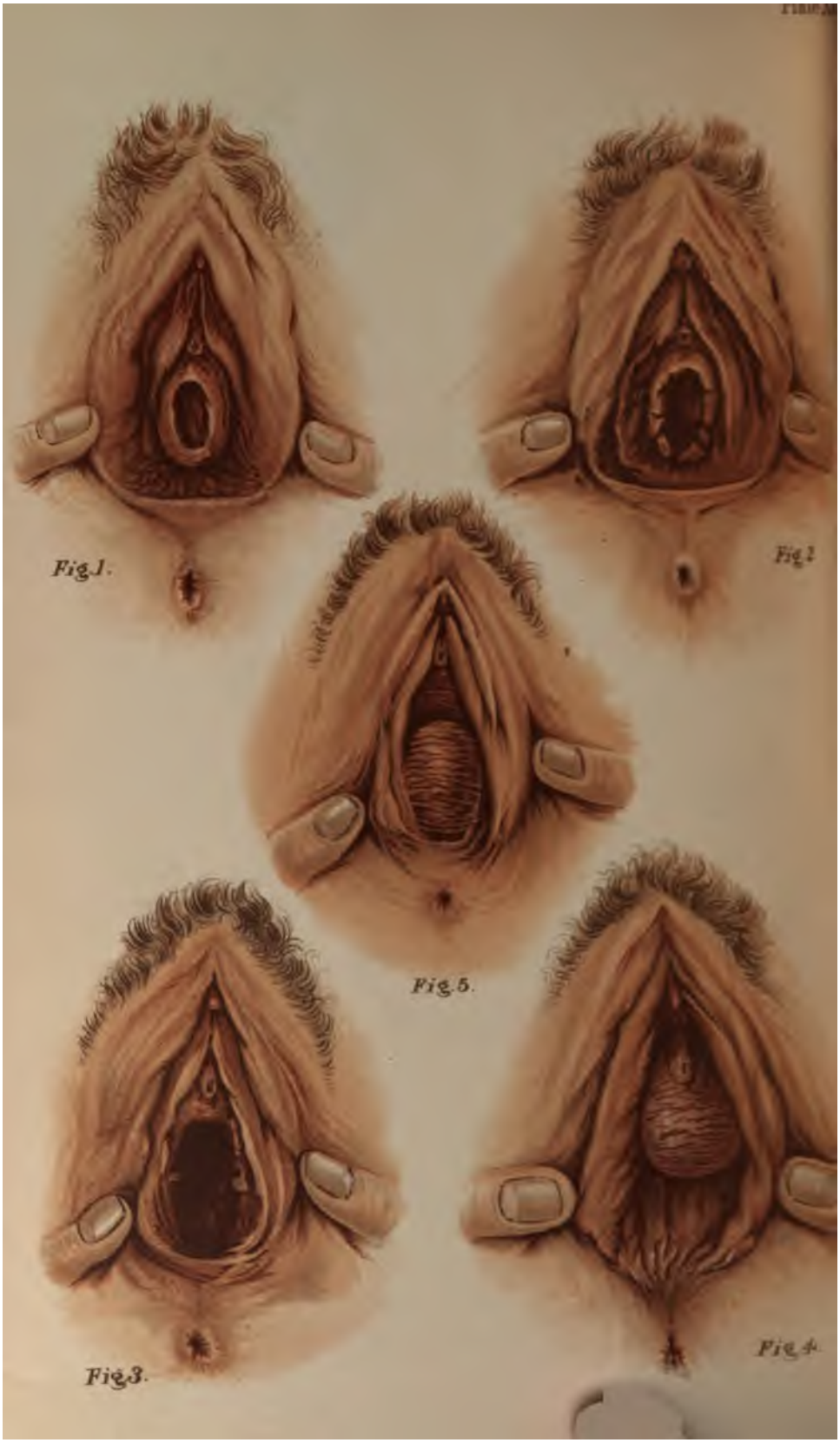


Fig.1.
Fig.2
Fig.5.
Fig.3.
Fig.4.

PLATE XII.

Figures drawn from life.

FIG. 1.

External genitals of virgin (the shape and consistency of the hymen vary greatly; the present may be considered the one most commonly seen).

FIG. 2.

External genitals of nulliparous woman, showing the hymen torn but not destroyed.

FIG. 3.

External genitals of parous female (one who has borne one or more children), showing destruction of hymen and fourchette, as caused by the passage of the child.

FIG. 4.

External genitals of parous woman, showing prolapse of anterior vaginal wall (cystocele) and laceration of the perineum.

FIG. 5.

External genitals of parous woman, showing prolapse of posterior vaginal wall (rectocele), with moderate laceration of perineum.

one pole in vagina, other on abdomen over tumor; current gradually increased to limit of endurance. On the 22d, fœtal motion was distinctly felt by the patient during the treatment. On the 23d, this motion had disappeared. On the 26th, soreness was gone, and pain on direct pressure over the tumor was much less. On the 28th, soreness and pain on pressure all gone, patient dressed and up for the first time in weeks. Tumor had now diminished very perceptibly, and breasts had become shrunken and flabby, these changes having begun after the first application of the current. On the 2d of June the current was used for the thirteenth and last time. The tumor could now be felt only with great difficulty externally; while an examination per vaginam showed it to be very much smaller and closely attached to the left horn of the uterus. The patient was now free from pain, and declared that she felt as well as she ever did. On the 16th, she left the city for home.

[1] Case XVIII.—Dr. E. V. Stoddard. Dr. M. D. Mann in consultation. Left tubal pregnancy; third month. The symptoms being very threatening, all preparations were made for laparotomy, but as a previous expedient it was determined to try electricity. With an electrode passed into the vagina and carried to the junction of the enlarged tube with the uterus, and a sponge electrode placed externally, a rapidly interrupted current, from five cells, with a long coil of fine copper wire, was passed through the tumor for ten minutes. During the next two days no attack of pain occurred, and a slight hemorrhage which had been present ceased. The electricity was repeated twice, at intervals of two days, the symptoms all ceasing after its first application. Normal menstruation the last of October, and again in four weeks. The tumor was then found to be very greatly reduced in size, the only trace being some thickening of the tube.

XI.

OBSTETRIC AND GYNECIC JURISPRUDENCE.

The questions of Medical Jurisprudence in its connection with obstetric and gynecological practice are far too many, and of too complex a nature, to be studied in full in the limited space here allotted to them; but, as the subject is one full of interest and value to every physician, an endeavor has been made to present concisely some of its most important subjects, giving, especially, those which would be most useful to any who might become involved in the meshes of law or be compelled to testify, on the witness-stand, on the obligations existing between physician and patient, or of the medico-legal aspects of paternity, legitimacy, pregnancy, live-birth, infanticide, abortion, and rape.

Duties of a Medical Witness.

When called upon to testify as a witness before a court of law, the physician should remember the weight which his statements may carry, and the influence which his evidence and the manner of delivering it may have, not only upon the opinion of the jury, but upon his own professional reputation.

[1] *Med. News*, Phila., July 11th, 1885, p. 31.

He should be completely and thoroughly prepared upon all parts of the subjects on which he may be called upon to give evidence. His demeanor should be that of an educated man, and suited to the seriousness of the occasion. He should keep his temper, no matter how exasperating the questions or manner of the examining counsel may be, for nothing tends more to destroy the weight of his evidence than any manifestations of flippancy or anger. He should use no more technical words than are absolutely necessary, but put his statements in the plainest and simplest terms. He should put no statements into a medical report which are not *strictly* within the subject of inquiry, from a medical or surgical point of view. His answers should be direct, concise, distinct, and audible; strictly confined to the terms of the question, and neither exaggerated nor minimized. If he entertains doubt about the matter at issue, let him express his doubts frankly, and thus save himself the mortification of having them extorted from him by an unpleasant cross-examination.

While the witness himself should never try to appear learned by using quotations from medical authors, yet when such are referred to by the questioning counsel, he should be on his guard that the passage is correctly quoted and understood, and, should always make sure, by referring to the work itself, that it is rightly quoted and understood. Written notes in evidence are valuable, though they can be used by the witness only for the purpose of "refreshing his memory." To be admissible they must be taken at the time of the observation, or as soon after as possible; they must be the original notes, and not a copy, and must not be changed by additions, interpolations, or erasures.

While in England the highest legal authorities have decided that medical men have no special privilege with regard to secrets of a professional nature, it has been decided in New York that "no person duly authorized to practice physic or surgery shall be allowed or compelled to disclose any information which he may have acquired in attending any patient in his professional character, and which information was necessary to enable him to prescribe for such patient as a physician, or to do any act for him as a surgeon."[1]

In complicated and important cases, medical men may be called upon who, by reason of special experience in certain branches, may be considered as *experts* in those branches, and therefore, presumably, be able to guide the court to a proper understanding of the facts of the case. An expert is usually called to give an opinion on certain facts already laid before the court by other witnesses, and must give his opinion on these facts as proved, he having no right to dispute them. He should give his *honest* opinion in a straightforward and impartial manner, and not allow himself to be influenced by the counsel of either side. A strict adherence to this rule

[1] Formerly, at common law the privileged communication was that between lawyer and client; this was considered sacred, common law being to a large extent opposed to Roman Catholicism. The confessional was opposed and the relation of priest and communicant was not regarded as privileged, as in the Catholic States of Europe. Afterwards, in common law the privilege was extended to physician and patient. The tendency has been to extend this privilege to other confidential relations, and to-day, in many jurisprudences, it covers lawyer and client, physician and patient, priest and communicant, and apothecary and customer.

would do much to remove the discredit which has fallen on *expert testimony*. As no expert witness can be compelled to give his *opinions* to the court, he is, therefore, not bound to accept a subpœna calling merely for his opinions, though if any fact relating to the case be within his personal knowledge, a subpœna served on him to speak on that fact is as imperative as when served on any other witness.

During the *examination in chief* the attorney tries to bring out the facts which are within the knowledge of the witness, by *questions which do not suggest their answers*, the only exception in which *leading* questions are allowed being when the witness is evidently unwilling, or "hostile," that is, when he is compelled to testify to certain facts which he has an object in concealing. In the *cross-examination*, the counsel on the opposite side—to whom great liberty is rightly allowed in the matter—endeavors, by *questions which may lead to their answers in the strongest form*, to detect any inconsistencies, flaws, or omissions in the testimony of the witness, and to cause it to appear in the light most favorable, or least damaging, to the side of the case they advocate. It is especially in the cross-examination that the strength or weakness of a witness manifests itself.

In *re-examination*, when a good examiner takes care to clear up any obscurities which there may be in the evidence of his witness, questions can only be asked the witness on subjects about which he has been cross-examined, or which arise from the cross-examination, and, if by permission of the court, new matter be introduced, it is always open to further cross-examination. The judge may ask the witness questions which may seem to him necessary to secure the ends of justice.

It is always well for a medical or scientific witness to make arrangements concerning the payment of his customary fees before being sworn to deliver his evidence, as otherwise he may be able to clain only the *legal* witness fees, which would not at all recompense him for his time and trouble.

Relations between Physician and Patient.

The law supposes that every practitioner shall use an ordinary degree of care and ability in the pursuance of his profession, and holds him liable for any gross carelessness or want of skill.[1]

[1] Brooks v. Clark, 57 Texas, 105. A physician attending a woman in labor, immediately on the birth of the child, and before its removal from the bed, tied two ligatures and cut the umbilical cord. The next morning it was discovered that he had ligated the child's penis, so that the resulting slough caused the loss of nearly the entire glans. In a suit by the child, for damages, the court refused to instruct the jury not to allow vindictive damages, if they should find that the injury was the result of innocent mistake, or accidental; but they were instructed to find only actual damages, if they found that the injury was the result of a want of ordinary care and diligence. The jury were only allowed to find exemplary damages, in case they believed "that in his conduct on that occasion defendant showed such an entire want of care as to evince that he was probably conscious of the probable consequences of his carelessness and indifference to the danger to which plaintiff was subjected."

The court held that a verdict of fifty-five hundred ($5500) dollars damages afforded no ground for reversal, as being excessive.

That when actual damage includes mental suffering through life, the court can rarely set aside a verdict for damages on the ground of its being excessive.

That when the act is so grossly negligent as to raise the presumption of indifference, evidence that, in other

While a physician is liable for injury caused by *omission*, as well as *commission*, errors in judgment are not considered malpractice in themselves when the party has not otherwise offended by negligence or rash experiments.

On making a promise to attend a woman when notified that she shall be in labor, he can be held liable for breach of contract, but not for personal injury or suffering, if, because of his willful neglect to fulfill his promise harm comes to the woman.[1]

If when attending a case of labor he, for some reason other than danger to his life, leaves the woman before delivery is completed, and before the arrival of another physician, he may be held liable for damage if the woman suffer from want of help, and for manslaughter if the patient dies in consequence of this neglect.[2]

He can also be held liable if, in the exercise of his profession, he unnecessarily takes a non-professional person into the presence of a patient—the patient supposing such person to be a medical man.[3]

On the other hand, he can collect his fee if, after contracting with a patient to attend her in labor, she, without notice and unnecessarily, neglects him, by calling in some other physician.

Legitimacy and Paternity.

A child born before wedlock is illegitimate, although the parents afterwards marry.

Every child born in wedlock, even though its conception may have occurred before marriage, is regarded as legitimate—that is, to have the mother's husband for its father—unless impossibility of intercourse be proved.

Non-access cannot be proved by husband or wife, but must be determined, by other evidence.

matters connected therewith, defendant has shown due care, and that actual indifference would have been indifference to his own interests, should not be allowed for any other purpose than to be considered by the jury in fixing the amount of exemplary damages. If they did not believe his conduct was such, they were to give compensatory damages.

[1] Hunter *v.* Ogden, 1 Queen's Bench, 132.

[2] Braxton Hicks, *Lond. Lancet*, Aug. 1st, 1885. A physician was tried for manslaughter, on account of having deserted a woman in labor, whom he had been called to attend, because of abusive language employed by the husband toward him. Other medical assistance was obtained after a time, but the labor was a difficult one, the woman subsequently dying of puerperal fever. The physician was acquitted, since it could not be proved that the same result might not have followed had he remained with the patient, but it was strongly laid down by the judge that a medical man should on no account leave a woman in labor, except his life was in peril; that he should tell them to get another attendant and not leave until the arrival of the other; otherwise, should the woman suffer from want of help he would be held responsible for it.

[3] Demay *v.* Roberts, 46 Michigan, 160. A physician took a non-professional, unmarried man with him to attend a case of confinement, where there was no emergency requiring the stranger's presence, telling the patient's husband that he had brought a friend with him to help carry his things, who was accordingly admitted, and held the patient's hand during a paroxysm of pain, the attendant having retired temporarily, on account of having received from his patient a kick in the pit of his stomach. The patient, on afterwards discovering the facts, sued both in damages. The court held, that the plaintiff and her husband had a right to presume that the outsider was a medical associate, and that, in obtaining admission without disclosing his true character, the defendants were guilty of deceit: that the plaintiff had a right to testify that she supposed he was a physician or medical student, and also to give evidence of whatever may have been said at the time tending to support such supposition; that damages may lie for an injury done when its full extent is discovered, though long after the act from which it springs.

If a husband have access to his wife (*i. e.*, if they cohabit), or if there exist between them the slightest possible description of intercourse, all children born of her are regarded as children of her lawful husband, and that although the woman be living in adultery at the time. On the other hand if husband and wife live separately, she living in adultery during the period of such separation, the legitimacy of children born to her under such circumstances cannot be maintained.

A posthumous child is considered legitimate, unless non-access, or impotence or sterility on the part of the husband can be proved.

Interesting and important questions, involving medical points relating to disputed paternity often arise, some of which require a medico-legal expert to expound, though more may be answered by any one who possesses a moderate knowledge of the causes and effects of impotence and sterility, and of the norm and the limits in the duration of pregnancy.

A knowledge of these subjects may also be important in questions relating to Rape or Bastardy, or where dissolution of marriage is sought on the ground of impotency.

Impotence and Sterility.—These are terms which, though definite and widely different in meaning, have been often used as if nearly synonymous, many seeming to forget that *impotence* means only inaptitude for coition, and *sterility* inability to procreate or conceive. Thus, a male having no penis, or no power of erection, or a female having no vagina, would be impotent; while a man whose semen contained no zöosperms, or a female with no ovaries, would be sterile. Impotency may depend on physical or moral causes, the latter not concerning the medical jurist.

While instances are on record of precocious youngsters attempting copulation at as early an age as four years, the male does not become fertile until some little time after the advent of puberty; for though emissions may then occur, the semen does not yet contain spermatozoa. I know of no case where a boy has become a father under fourteen years of age, and instances of such early paternity are rare. On the other hand, spermatozoa, and the possibility of fruitful intercourse may exist in very old men, though instances of their absence become progressively more numerous after the age of sixty-five.

Sterility or impotence, one or both, may arise from many pathological causes, conditions, or states. With an extreme degree of epi- or hypospadias, where the orifice of the urethra is so placed as not to come in contact with any part of the vaginal canal during copulation, a man would be, probably, both impotent and virtually sterile, *though not surely so*, as conception has occurred where semen has been only deposited upon the vulva. The entire absence of a penis, therefore, while it would render the individual impotent, would not, necessarily, cause sterility. Amputation of the penis, unless so close that there is no protrusion during excitement, does not always render a man impotent. Most hermaphrodites are sterile, and very many impotent.

In the exceedingly rare cases of congenital absence of one testicle, the other has generally been well formed and normal. Where one testicle has not descended into the scrotum, the individual is often sterile, and where both remain undescended, almost invariably so, although the physical development is generally manly and complete. After castration, if any of the secreting tubes of a testis remain, the man may remain fertile.

Where there is congenital absence or non-development of testicles, or where they have been removed in infancy, the individual is always languid, slenderly formed, though usually fat, with little hair on the face and pubes, with undeveloped genitals, and weak, falsetto voice. If the testes be removed after puberty, the masculine character is generally retained, only rarely becoming womanish.

Excessive masturbation may cause both impotence and sterility.

Advanced disease of the penis or testes, cancer, syphilis, etc., or tubercular deposits, congenital malformations, double epididymitis from gonorrhœa, or wounds from lateral lithotomy, by causing occlusion of the secretory ducts; or urethral stricture, by causing the semen to flow into the bladder, may all produce sterility.

Extreme physical weakness, resulting from disease of any kind, notably decreases sexual power, and often induces both impotence and sterility, as do also the excessive use of alcohol, opium, or tobacco. Many other drugs may produce the same effects temporarily.

In examining a man supposed to be impotent, if the genitals are well developed and healthy, and the general health and condition good, we assume, within the usual limits of age, that there is capacity for sexual intercourse. If after examination we remain in doubt, we should not hesitate to admit it.

Impotence in the *female* is more limited than in man, it sufficing for coitus that the vagina be sufficiently patent to receive the penis and permit copulation. This may be prevented by adhesions of the labia (always accidental); by excessive length of the nymphæ, or by their enlargement, the result of elephantiasis or syphilis; by the condition known as transverse female hermaphrodism; by total absence of the vagina, or its defective formation, either by congenital narrowness (rare), or by bifidity, where neither canal will permit of copulation, or imperforate hymen, or membranous occlusion of its lower part; by abnormal orifices from the vagina into the rectum, bladder, or urethra; by vaginismus.

The length of the period of possible fertility in women is usually the same as that of their menstrual life, though it may happen occasionally that a woman conceives before the oncoming of menstruation or after its cessation. Ovulation is the best proof of aptitude for procreation. It is evident that those conditions producing impotence in the female will necessarily cause sterility, actual or virtual. Sterility may be caused by any factor which prevents or hinders the introduction of spermatozoa into the body of the uterus; thus an unusual difference in the length of the anterior and posterior vaginal walls, a faulty insertion of the uterus into the vagina, a marked in-

crease in the size and flabbiness of that canal, or any condition which tends to produce a copulative sac which diverts the semen from the uterine axis, may produce this condition. Also congenital or acquired contractions of the cervical canal, a long and conical vaginal portion of the cervix, deep lacerations or hypertrophy of this part, or any alteration of its structure, well marked versions, especially where the displacement is kept up by adhesions, very acid vaginal secretions, tenacious mucus in the cervix, the various inflammations of the tubes, or their constriction or compression by the products of inflammation, defective development of the uterus, disease or absence of the ovaries.

Little difficulty is usually found in forming a conclusion concerning the aptitude of a woman for coition. In examination especial notice should be taken of the development of the external genitals and breasts, of unusual tenderness or irritability of the genitals, or of any hysterical manifestations which might render copulation difficult, of the character and condition of the hymen, of the dilatability and size of the vagina, and of any abnormality.

When called to testify as to the fertile or sterile condition of a woman, we must frame our opinions in the most guarded manner, clearly stating the difficulties of a definite answer to the court, for, though many conditions may exist which usually cause barrenness, a woman may conceive when nearly all the above causes of sterility are present. While inaptitude for conception may often be inferentially stated, nothing short of complete closure of vagina, or absence of uterus and ovaries will insure an absolute assertion of sterility. At a necropsy we may be able to reach conclusions which, during life, were impossible. It should be stated that women have conceived after double ovariotomy; in these cases there must have been a third ovary, of which there are several undoubted cases on record, or one ovary must have been imperfectly removed, some ovarian tissue being left behind.

Limits of Duration of Pregnancy.—While most physicians, and usually with a fair degree of correctness, calculate the time of labor as a certain period from the cessation of the catamenia, it can easily be shown how liable this method is to error; for it is well known that conception can take place during any part of the intermenstrual period, thus allowing a latitude which may be as great as four weeks; again, it may sometimes happen that menstruation, or a flow simulating it, may occur for one or more periods after conception has taken place, or conversely, that it may be absent before impregnation has occurred. Even in the rare cases, where gravidity can be dated from a single coitus, there creeps in a source of error, for, though we know when insemination occurs, we cannot tell—as the vital cells may remain alive in the maternal passages for days—when impregnation is accomplished.

As it is thus impossible to definitely fix the time of impregnation, so is it impossible to state the exact duration of a normal pregnancy. Indeed, there is strong reason to doubt that the time is an exact one, it probably differing

slightly in different women, and even in the same woman in different pregnancies; that, however, its average duration is about 270 to 280 days is the accepted belief.

As impregnation is most usual immediately after the cessation of a menstrual period, a calculation of the time of labor, counting 280 days from this date, is usually approximately correct, yet it must be remembered, as I have stated above, that impregnation may occur at other times, and that from a medico-legal standpoint exceptional cases are the most important.

The determination of the earliest period at which a child may be born and be capable of living for the ordinary period of human existence, the period of viability, is sometimes a matter of grave importance, affecting, not only the legitimacy of children—as, when a child is born soon after marriage, or when the husband has had access to his wife for a limited time only—but the honor of parents and the peace of families.

The two points usually requiring the attention of the medical jurist in questions of this nature are: *Is a child of the age stated or estimated viable, and, granting it to be alive when born, is it probable that it could be reared?*

The practical conclusions which Tidy[1] draws from a large amount of evidence are as follows:—

1. "Allowing that from the first moment of impregnation the ovum is truly alive; and, further, that mere motion of limbs, or evidence of circulation, without active respiration, are sufficient to constitute live-birth, nevertheless, there is no evidence to show that a fœtus born at an earlier period than between the fourth and fifth month of uterine existence, can, in any sense, be said to be born alive, much less lead an independent life, i. e., a life apart from its mother.

2. "That living children have been born between the fourth and fifth months of uterine life. There being, however, no well authenticated case where less than a five months child has lived beyond twenty-four hours after its birth, and but one where it has lived for twenty-four hours.

3. "That children born alive at the fifth and between the fifth and sixth months of utero-gestation mostly die after a few hours, yet there are a limited number of recorded cases, where such children have been reared, and have even reached adult age.

4. "That several well authenticated cases exist where children born between the sixth and seventh months, and even at the sixth month, have reached adult age, but that in such cases more than ordinary care and attention have been needed to maintain life, at least for some time after birth.

5. "That in all cases of early birth, beyond the facts indicated by well authenticated records, the question of the character of the parents, the conditions of the accouchement—such as its concealment and certain other general considerations—must, of necessity, constitute important evidence on which a jury should rely to decide the question of legitimacy."

As a learned obstetrician has said: "Take care not to be deceived. I

[1] Legal Medicine: Tidy, N. Y., 1884, vol. iii, p. 31.

have known many remarkable cases of fully developed and mature children being born within seven months of marriage. They are commonly regarded as marvels, but, in my experience, they are marvels limited to first pregnancies!"

In all cases of this kind, we must take care to ascertain whether the appearances shown by the child at birth correspond or not with its alleged shortened term of intra-uterine existence. Some of the most important signs showing the approximate period of development are, briefly, as follows:[1] At *term* (ninth month) the fœtus presents a certain general appearance of maturity which is familiar to experts; the skin is paler than when less mature; the down (lanugo), to a great extent, has disappeared; the white points caused by dilatation of the sebaceous follicles, found in many cases, on the chin, under lip, nose, cheeks, and forehead, diminish in proportion to the maturity of the fœtus, at term being found only on tip of nose; the pupillary membrane has disappeared; there is more or less hair, of a length of from nine to twelve lines, on the head; the nails reach the ends of the fingers; the cartilages of ears and nose feel cartilaginous; the testicles will probably be in the scrotum, and the scrotum itself will be corrugated; the labia majora usually nearly cover the nymphæ and clitoris; the length is from seventeen to twenty-one inches; the weight five to nine pounds.

At *eight* months: Length, fourteen to sixteen inches; weight, four to five pounds; vernix caseosa all over skin; nails reach extremities of fingers; membrana pupillaris becomes invisible during the month; testicles descend into internal ring; the middle point is nearer the umbilicus than the sternum.

At *seven* months: Length, thirteen to fifteen inches; weight, three to four pounds; skin rosy, thick and fibrous; sebaceous covering appears; nails do not yet reach extremities of fingers; eyelids no longer adherent; membrana pupillaris faint; a point of ossification in the astragalus; meconium occupies nearly the whole of the large intestine; left lobe of liver nearly as large as the right; gall-bladder contains bile; middle point a little below end of sternum.

At *six* months: Length, nine to ten inches; weight, one pound; skin presents some appearance of fibrous structure; eyelids agglutinated; membrana pupillaris present; sacculi begin to appear in the colon; funis inserted a little above pubis; face of a purplish red; hair white or silvery; vernix caseosa begins to appear; liver dark red; gall-bladder contains serous fluid destitute of bitterness; testes near kidneys; middle point at lower end of sternum; points of ossification in four divisions of sternum.

More of the questions involving legitimacy, or the chastity of females turn upon *protracted* than upon *premature* delivery. While we have very strong and reliable evidence that pregnancy *may* be protracted to a period between 280 and 325 days, we have no *absolute* evidence that this is so. These cases

[1] Adapted from Tidy: whom see, *loc cit.* For more minute details; also Beaunis & Bouchard.

are generally decided as much from the moral evidence as from the medical, it being conceded that such prolonged periods of gestation are possible. Individual experience is here of little value, it being important to consider all recorded instances, and to gauge their actual worth.

Affiliation.—May sometimes be settled by likeness to supposed father, not only in features, but in voice, gesture, attitude, action, color, and other characteristics, the evidence, from the nature of the case, being necessarily circumstantial.

PREGNANCY.—Where it becomes necessary, for legal purposes, to determine the existence or non-existence of gravidity, it is requisite that the physician proceed with great caution and thoroughness, and with assistance from a colleague; that where important questions are involved, the examination should be made in the presence of a witness; that no reliance be placed upon the statements or fancies of the woman or her friends, but on the *physical signs only;* that one single symptom should never be relied upon as proof of gravidity, it being necessary that several marked signs should be undoubtedly present; that he should remember that a medical man is not justified in examining a woman *without her full consent*—given in the presence of witnesses—except in the case of a prisoner under a written order from the court, and that examination under other circumstances may render him liable for damages, or even be construed as an assault.

The signs and symptoms of pregnancy (p. 237), and the methods of examination (p. 1098) having already been given, it is not necessary to repeat them here.

Feigned pregnancy may always be detected by a well informed physician, for women always feign *advanced* pregnancy. Examination should be insisted upon.

Concealment of pregnancy during its whole term is a punishable offense, if the child of which the woman is delivered be found dead or be missing, on the principle that its death was due to want of proper care.

A woman may be in even an advanced stage of pregnancy without knowing or even suspecting it, but such cases are rare, and must always be looked upon with suspicion. On the other hand, she may consider herself pregnant when not so.

Pregnancy may require to be verified *after death*, to determine identity, or to prove or disprove charges of unchastity. Proof here rests upon discovery of traces of the ovum. It should be remembered that the *unimpregnated* uterus undergoes decomposition much more slowly than other organs, often remaining firm and hard for many months.

DELIVERY.—The determination of *delivery* is much more important in many ways than that of pregnancy, especially in *concealment of birth, abortion, infanticide, questions of suppositious children*, etc.

Pregnancy may have been concealed, and admission of delivery may be criminating; in such cases the medical examiner has no right to extort confession.

The proofs of delivery are almost *nil* after two or three months. The woman may show the effects of hemorrhage, but this is not proof; after three months the os may be patulous; there *may* be some lochial discharge, and we *may* find in the uterus shreds of placental tissue. Twenty-four or thirty-six hours after an abortion, we may find no *positive* traces of the delivery.

Signs of Recent Delivery in the Living:—

General weakness and indisposition; paleness of face; dark circles around the eyes; *all these symptoms suddenly appearing*, though they may occur after any severe illness, are suspicious.

The breasts are full after three or four days; nipples enlarged; marked areola. Skin of abdomen relaxed, may lie in folds or wrinkles. Striæ albicantes. Uterus may be easily felt through the abdominal wall, reaching above the pubes. Pigmentation of linea centralis from pubes to navel.

Generative passages swollen, contused, lacerated, dilated, may contain clots of blood; os uteri dilated, cervix may be lacerated; lochia present.

These signs are only found shortly after delivery. Vigorous and strong women, especially multiparæ, may resume the natural state in a few days. The signs commonly disappear after ten to fourteen days, so that we may then be unable to say positively that the woman has been recently delivered. The earlier the examination is made the more satisfactory will it be. Microscopic examination of the lochia may reveal chorionic villi in early abortion.

Signs of remote delivery may be required in cases of contested legitimacy, where it is charged that a child has been substituted which the woman claims as her own, or in infanticide several months before the examination: lacerations or fissures of the cervix uteri; destruction and obliteration of the hymen and traces of laceration at the posterior vulval commissure are the most reliable signs.

Feigned delivery, for purposes of extorting charity, compelling marriage, or disinheriting parties, is usually easily detected and disproved, because the woman feigns *recent* delivery. It is necessary in these cases to proceed at once, and with great caution, to make a *careful* examination of the person, to examine and see that the placenta is *genuine;* to examine the child and observe whether its appearance corresponds with the period of the alleged labor.

I feel it my duty to call particular attention to the signs of parity and nulliparity, because attempts are not unfrequently made by patients to deceive the physician as to the previous occurrence of conception. The presence of a hymen which, although torn in one or more directions, still can be restored to its apparent integrity, will generally show that nothing more than coition has taken place, except, perhaps, an early abortion; but if the

posterior circumference of the hymen is absent, and the fourchette torn, that is, the navicular fossa obliterated, the chances are greatly in favor of the distention of the vaginal orifice by a large body, like the head of a full grown child. Of course, rare exceptions to either condition may occur, and it is well not to be too positive in making a statement.

Unconscious delivery—in questions of infanticide—undoubtedly may take place, though *rarely*, except when the woman is comatose, or strongly under the influence of some narcotic poison, chloroform, ether or alcohol, or puerperal convulsions. A multiparæ may drop her child in the water-closet and be unconscious of its birth, or be unable to stir until too late to save it.

Post-mortem delivery may take place, and the uterus expel its contents even when there have been no symptoms of labor before death, this effect being caused by contractile power remaining in the uterus after the rest of the body is dead, or by the pressure of the gases of putrefaction.

Signs of Delivery in the Dead Body:—

Examinations of this nature are almost invariably confined to the investigation of criminal abortion. When death has occurred within three to five days after delivery, satisfactory proofs can be obtained post-mortem; when after several weeks, detection may be difficult or impossible.

At *full term* an examination soon after delivery reveals the uterus as a flabby, flattened pouch, nine to twelve inches long, and one to one and a half inches thick; its cavity may contain blood clots, or shreds of membrane or placenta, and its inner surface shows the remains of the decidua. The section of its wall shows many vessels. The placental site is dark, gangrenous looking, and shows many semilunar or valvular openings of venous sinuses. The uterine adnexa are congested and purplish. The os uteri is patulous and ecchymotic. The genital passages may show unhealed lacerations and ecchymotic spots. The corpora lutea, upon which so much importance was formerly placed, have been found to be unreliable as signs of recent delivery, and need not here be discussed.

At earlier periods of pregnancy we would find these same signs, though less in degree; evidences that the uterus had been exposed to violence, as perforations or lacerations, should always be noted.

The difficulty of finding satisfactory proof of recent delivery increases inversely to the duration of the pregnancy, and in the early months, though we may be morally sure that an abortion has occurred, it may be impossible to swear that the same appearances that we find could not be produced by other causes than the growth and discharge of an ovum.

LIVE BIRTH.

Was the child born alive or dead? is the question of first importance in criminal cases involving charges of infanticide and concealment of birth, and

in civil cases involving "tenancy by courtesy;"[1] further, a fœtus in utero, "en ventre la mere," may have a legacy or estate made over to it, may have a guardian assigned to it, may claim damages, may be appointed an executor; though none of these conditions take effect unless the child be born alive.

Date of Birth.—As evidence is frequently demanded in the courts respecting the date of birth, it is important for the obstetrician to keep a reliable record of births, and to be careful in noting the *exact* time at which the child is born, remembering that the child is not *legally* born until *the whole of its body has come entirely into the world.*

Concealment of Birth.—"If any woman shall be delivered of a child, *every person* who shall by any secret disposition of the dead body of the said child, whether such child died before, at, or after its birth, endeavor to conceal the birth thereof, shall be guilty of a misdemeanor."

Signs of Life or Death manifested immediately after Delivery.[2]—While visible respiration of a child, or its manifestation by crying, is an undoubted sign of its having been born alive, it is not necessary to establish the fact of live birth, it being sufficient, for the child to acquire its civil rights, that it manifest any reliable sign of vitality, as movement (muscular contraction), pulsation of the cord, or beating of the heart. It is necessary that the sign of vitality be shown after the child is completely born; thus, though the child should cry and move vigorously while the body was still in the maternal passages, but show no sign of vitality when completely born, it would be accounted a still-birth.

The signs of the child's *death*, which should be noted at the time of delivery, are the absence of muscular or respiratory movements, of funic pulsation, of beating of the heart, and, when the child has been dead for some little time, the appearance of maceration or putrefaction.

The Evidences of Live or Still Birth as furnished by the Autopsy.—Notes of the conditions found should be made on the spot, and should embrace the following particulars:[3]—

I. External Examination.

1. Everything relating to the external appearance of the body, its shape, position, conformation, condition as regards putrefaction, spots, marks, ecchymoses, etc.

[1] Bouvier L. Dic., 416; vol. i. The estate to which by common law a man is entitled on the death of his wife, in the lands or tenements of which she was seised in possession in fee simple or entail during their coverture, provided they have had lawful issue born alive, which might have been capable of inheriting the estate. It is a freehold estate for the term of his natural life. In the common law the word is used in the phrases tenant by courtesy, or estate by courtesy, but seldom alone.

[2] *Beck's Med. Jurisprudence*, 12th Ed., vol. i, p. 415, and *Wharton* and *Stillé*, *Med. Jurisprudence*, 3d Ed., vol. ii, p. 1209.

[3] *Tidy; loc. cit.*, p. 178, vol. iii.

2. Its size: including not merely the length of the body, but the dimensions of the head and thorax.
3. Its weight.
4. The condition of the navel and the umbilical cord.

II. Internal Examination.

1. *The condition of the respiratory organs.*
   (*a*) The dimensions and shape of the thorax.
   (*b*) The situation of the diaphragm.
   (*c*) The color, volume, shape, situation, consistency, density, absolute weight, and specific weight of the lungs.
2. *The condition of the organs of circulation.*
   (*a*) The condition of the heart and its cavities.
   (*b*) The foramen ovale.
   (*c*) The ductus arteriosus, its dimensions and shape.
   (*d*) The ductus venosus.
   (*e*) The state of the umbilical vessels.
3. *The condition of the abdominal organs.*
   (*a*) The liver, its weight and size.
   (*b*) The stomach and intestine. The presence or absence of air, food, medicine, meconium, etc.
   (*c*) The state of the urinary bladder and kidneys (uric acid infarction).
4. *The condition of the brain and spinal marrow.* The cranium should be examined for fractures, punctures, etc.

While, in many instances, it is easy to prove that a child was born alive and lived for a variable time; in other cases, it may be difficult or impossible to say whether the child was born alive or not.

For instance, if the child, though born alive, was suffocated, purposely or accidentally, before it had breathed, we probably would not be able to find at a post-mortem examination any satisfactory proof that life had existed, and yet we could not say that it had not. Marks of violence might afford uncertain proof. The only conditions which would afford certain proof of ante-natal death, would be those of intra-uterine putrefaction or maceration, and these may, in exceptional circumstances, as where the body has lain, protected from light, in warm sea water, be closely simulated.

Intra-uterine putrefaction is characterized by marked flaccidity of the body, so that it flattens out by its own weight and appears ready to fall to pieces, by a coppery-red color of the skin without a shade of green about it, by peeling of the cuticle, and by a penetrating, peculiarly sweetish, stale and unendurable stench. Maceration differs from putrefaction in that it occurs when air does not gain access to the fœtus; we here get the same peculiar softness and flabbiness of the body, but the stench is absent, and the coloration much less marked.

Some of the most important means of determining whether the child was born alive are as follows:—

1. *The Hydrostatic Test,*[1] for determining whether the lungs have been naturally inflated or not, *i.e.*, whether the child has breathed.
   (*a*) "Remove the lungs and heart together, by knife, from the thorax, securing in the first instance the larger vessels, to prevent escape of blood.
   (*b*) "Place them entire in a pailful of water (rain water being employed by preference), at 15° C. (60° F.), and note if the lungs float and are able to buoy up the heart with them; in other words, if the thoracic viscera float as a whole. Should they sink, note whether they do so slowly or rapidly, and whether they sink completely to the bottom of the pail, or a short distance only below the surface of the water.
   (*c*) "Test each lung separately in a similar manner, and note whether both lungs float or sink, or if one sinks while the other floats.
   (*d*) "Cut each lung into from 15 to 20 pieces, preserving the positions of the several pieces, and note whether the separate portions sink or float.
   (*e*) "Wrap the several portions that float, separately, in a coarse cloth, place them on the floor, and cover them with a piece of board. Stand on the board (avoiding any jerking movement), so as to apply a regular and even pressure to the several portions. This done, again determine whether the several pieces sink or float in water."

The two general conclusions to be drawn from the hydrostatic test may be broadly stated as follows:—

(1) "If the lungs float whole and are able to buoy up the heart with them, and if they also float when cut into small pieces, but more especially if the bouyancy of the several pieces continues after the application of pressure, there is strong presumptive evidence that the child has breathed, and therefore has lived; but this does not prove that the child was born alive in the legal sense, that is, that it drew air into its lungs *after* it was *completely* external to the mother.

(2) "If the lungs sink in water whole and after being cut into pieces, there is strong presumptive evidence that the child has not breathed; but this does not necessarily prove that the child was born dead.

"In stating the conclusions to be drawn from the hydrostatic test, it will be noted that life and breathing are not regarded as convertible terms, the fact being that this test is not a test of live birth, but of respiration only. Respiration, in law, is not an exclusive proof of live birth. No doubt, physiologically, a child that has breathed has lived, but it does not follow that a child that has not breathed has not lived."

Lungs which have not breathed are dark in color—blue-black, maroon or purple—resembling liver; the air vesicles are not visible to the naked eye; they do not crepitate when squeezed or cut; they contain but little blood and that is not frothy unless there is putrefaction; they sink in water unless putrid, and often even then; bubbles of gas arising from putrefaction may be squeezed out, and as they escape are usually noted to be of large size.

[1] Tidy: *loc. cit*, vol. iii, p. 164.

Lungs which have breathed are light in color—rose-pink, pale-pink, light red, or crimson—mottled, and with air vesicles distinctly visible to the naked eye, or to a lens of very low power; they crepitate freely, and contain a good deal of frothy blood; they float in water, or at all events the parts which have breathed float, and the air cannot be squeezed out.

Where the *lungs have been artificially inflated*—a difficult procedure while they remain in situ—we observe, according to Casper, "a sound of crepitation without any escape of bloody froth on incision, *laceration* of the pulmonary cells with hyperæmia, *bright cinnabar red* color of the lungs *without any marbling*, and, perhaps, air in the (artificially inflated) stomach and intestines."

The Appearance of the Funis and Umbilicus.—Soon after the cord has been ligated it begins to shrink and dry up, so that, usually by the end of the third, though sometimes as early as the first or as late as the fifth day, it becomes completely *desiccated*, brown, flat, parchmenty, and translucent. These changes do not take place at all, or but to a slight extent, if the child is dead. Mummification does not take place if the new-born be thrown into the water, nor does a mummified cord resume its original condition by being soaked. This fact is of importance, as showing whether a child was thrown into the water after an interval of several days, or soon after birth.

A sign which is absolutely indicative of live-birth, and that life has continued for a certain time, is the *line of demarcation* where the separation of the cord ultimately occurs. This line is generally marked about the third day, and is characterized by a red line of capillary congestion, by thickening and swelling and, commonly, by some purulent secretion. The cord usually falls off about the fifth day (limits about 2 to 15 days), cicatrization of the umbilicus beginning on the tenth day, and being complete about the twelfth.

Condition of the Abdominal Organs.—The presence of food or medicine in the stomach, unless placed there after death, proves that the child must have lived after birth.

The presence of air-bubbles *minutely* incorporated with the glairy mucus of the stomach, is strong proof of live-birth or at least of respiration, air which may have been introduced by artificial inflation not being mixed with the gastric mucus. If the child has been drowned or smothered, the contents of the stomach may render important evidence, as some of the liquid in which it was drowned, or substance (as meal or bran) in which it was smothered, may have been swallowed.

Though not absolute proof, the absence of meconium from the intestines is strong evidence that the child has lived, at least for some hours; the presence of large amounts in the colon and part of the small intestine, that if it lived at all, its life was short

The presence of the golden-yellow streaks in the papillæ of the kidneys, caused by uric acid infarction, is thought by many to be proof positive that the child has lived; it must, at least, be considered a strong corroborative sign.

Length of Survival After Birth.—The signs here are so uncertain that medical evidence must necessarily be very guarded; great precision is, however, not usually demanded.

First twenty-four hours. Stomach contains a frothy fluid; clots found in vessels of cord; signs very uncertain.

Second twenty-four hours. Skin less red than during first day; meconium discharged, though there is still some greenish mucus in large intestine; contraction and thickening of coats of the umbilical arteries near umbilicus. Cord beginning to shrivel, but still soft and bluish.

Third twenty-four hours. Skin yellowish; epidermis begins to exfoliate; cord brown and drying; umbilical arteries contracted throughout the greater part of their extent.

Fourth twenty-four hours. Skin more yellow; epidermal desquamation on chest and abdomen; cord dry, inflamed ring, and slight purulent discharge at point of ultimate separation.

After fourth twenty-four hours. Cord usually falls on fifth day; ductus arteriosus closed on eighth to tenth day; cicatrization of umbilicus, tenth to twelfth day; umbilicus completely healed in third week.

INFANTICIDE.

In cases of infanticide, medical evidence will usually be required to determine whether the alleged mother has been delivered of a child, and whether the signs of delivery agree, as to time, with the appearances presented by the child (see p. 1185); but the most important question will be, "*Was the death of the child due to natural or to other causes?*"

Natural Causes of Death in the New-born.—Death may arise from *congenital debility* in children born prematurely, or suffering from congenital disease, as syphilis or carcinoma; from various *diseased conditions* of the lungs, brain and cord, or abdominal organs; from *congenital malformations* of the large vessels or heart, or obstruction or atresia of the alimentary canal at some part, or from some marked defect in development[1]; from exhaustion from *protracted parturition*; from *natural suffocation*, from obstruction to the fœtal circulation, by pressure on the cord in breech or footling cases, or in prolapse of the cord, or its being coiled about the neck of the fœtus; from premature separation of the placenta; from contraction of the uterus about the neck or body of the child; or from its being born in intact membranes; from *hemorrhage* from various internal organs, from the genitals, or from the rectum, or less rarely from the cord, or from the umbilicus, after the separation of the funis. Fatal hemorrhage from the cord may occur, if it be not properly ligated after its division, or after its accidental rupture; it is more apt to occur when the cord is cut than when torn, when the cord is thick and gelatinous, rather than thin and small; the liability increasing the nearer

[1] Monstrosities are usually of feeble vitality, and short lived The destruction of such a being by nurse, doctor, or other person, would render him liable to be convicted of murder.

the division is to the umbilicus, and diminishing after the pulmonary circulation has become established.

Accidental or Criminal Causes of Death in the New-born.—Cases of suspected infanticide always require most careful and searching investigation, both as regards the condition and actions of the mother, to whom the suspicion of guilt is, usually, most easily traced, and to the condition of the body of the infant, and the causes from which its death might have arisen. In addition to the facts learned from a careful post-mortem examination of the child, the physician may be required to testify as to whether the mother had sufficient strength, knowledge, presence of mind, or sanity to have prevented the death of the child by proper care. The law considers that no woman is competent to attend to her child at the time of confinement, and that, therefore, she should inform others of her pregnancy, and that any married woman knows what should be done for a new-born child. When, therefore, an accusation of child-murder is made, the defense that the woman did not know what ought to be done, or was faint or delirious, must be supplemented by further evidence that the woman was suddenly taken in labor while alone, and away from assistance. The opinion of the physician in these cases must be very guarded, and only expressed after careful and thorough investigation of the facts of the case; especially is this caution necessary when the woman is single, and the child illegitimate

Suffocation is a very common way of causing an infant's death, and may result from carelessness or criminal violence. In a child supposed to have died from this cause, we should carefully examine the mouth and trachea, externally and internally; internally for materials in which the child may have been suffocated, and externally for marks or even portions of a fabric that might have been held over the mouth for the purpose of excluding air, and for other marks indicative of compression by the fingers, always bearing in mind that the *apparent* is not always the *real* cause of death.

Strangulation may (as has been noted) occur *naturally*, from the coiling of the funis about the neck, or from criminal violence. The mark left by the natural twisting of the cord about the neck is broad, grooved, perfectly soft, and never excoriated, and the lungs will be found uninflated. Marks formed by the natural creases must not be confounded with those produced by strangulation. Where a child has been strangled after birth, the post-mortem appearances will uniformly be, congestion of the right heart, engorgement of the lungs, with punctiform and other *ecchymoses*, usually bright in color, on the pleuræ, pericardium, endocardium, peritonæum, and bronchial mucous membrane.

Drowning.—When a child has not breathed it is impossible to show that its death had resulted from drowning. If a child had swallowed dirty water containing shells, sea-weeds, sand, mud, diatoms, etc., it would be strong evidence that it had been placed in the water alive.

Wounds.—The presence of incised, lacerated, punctured, or contused wounds on the body of a child, is always suggestive of murder.

Fractures may occur from accidents, or a fall, or kick on the abdomen happening to the mother before the birth of the child, or from the child falling to the ground during an unexpected delivery; from the use of obstetrical instruments, or from criminal violence. It is well to note that fractures purposely inflicted are usually far more severe than any accidental injury, and are nearly always accompanied by other signs of violence.

Poisoning of infants is rare, except by the use of opium; death from *cold* and *exposure* usually occurs in the winter, and the evidence is mostly circumstantial; death from *starvation*—as a child will live two or three days without food—is almost invariably of set purpose; death from *burns* or scalds may be accidental or criminal, and here again the evidence must decide the fact.

Abortion.

In law, the term *abortion* is applied to the expulsion of the fœtus at any period of pregnancy.

The causes may be *natural* or *violent*. The *natural* causes (see page 561) may be internal disease, predisposition, moral shock, fevers, syphilis, or any cause which strongly affects the general or uterine system. Natural abortion is most frequent at a time which would have been a menstrual period.

The *violent* causes may be accidental or criminal, it being generally easy to distinguish between the two.

Criminal Abortion.—"A person who, with intent thereby to procure the miscarriage of a woman—unless the same is necessary to preserve the life of the woman, or of the child with which she is pregnant—either prescribes, supplies, or administers to a woman, whether pregnant or not, or advises or causes a woman to take, any medicine, drug, or substance, or uses or causes to be used any instrument or other means, is guilty of abortion."[1]

Criminal abortion, rarely attempted before the third month, and usually in the fourth or fifth, may be produced by mechanical or medicinal means, as very severe and prolonged exercise, jolting, blows, or any severe physical shock; by direct violence to the uterus itself, thrusting instruments into its cavity, cutting or tearing it; by rupturing the membranes, or by destroying the life of the child, thereby leading to its expulsion; by the use of almost any irritant drug in semi-poisonous doses.[2]

As these attempts are usually made by ignorant persons, the woman generally dies from metro-peritonitis, or other serious sequence. Death under these circumstances may be considered murder (usually manslaughter, first degree), though the accused did not intend to destroy life.

A medical witness should always state that all these methods of producing criminal abortion are uncertain in their operation, and always dangerous and often fatal to the mother.

[1] Penal code, New York, 1881, art. 294. [2] Taylor, *loc. cit.*, vol. ii, p. 183. Tidy, *loc. cit.*, vol. iii, p 102.

Medico-legal examinations in cases of abortion, should be as follows (from Tidy):—

I. *Examination of the Mother, if Living.*

(*a*) Temperature.

(*b*) As to the woman's predisposition to abort, and the period at which abortion has commonly occurred.

(*c*) General state of health. Note existence of leucorrhœa, excessive menstruation, syphilis, asthma, malignant disease, uterine diseases, etc.

(*d*) Whether the woman be well or ill formed. Note pelvic malformations, effects of tight lacing, etc.

(*e*) Whether or not there be signs of recent delivery or of the expulsion of uterine contents.

(*f*) Whether any cause can be assigned to account for the abortion, *e.g.*, violent coughing, bloodletting, straining at stool, violent exercise, undue excitement, septic poisoning, violence, administration of medicines, etc.

(*g*) All injuries of the genital organs. Consider whether the injuries might not be self-inflicted.

II. *Examination of the Body of the Mother, if Dead.*

Take care not to mistake the effects of menstruation for those produced by abortion; to avoid injuring the parts by the knife or otherwise, during the autopsy, and to note the possibility of the injuries being self-inflicted.

(*a*) Note the existence of any marks of violence on the abdomen or other parts.

(*b*) The condition of the genital organs, noting all inflammations, rents, tears, perforations, etc. (If the uterus be injured, it should be preserved.)

Note also:—

1. The condition of the passages, relaxed or otherwise.
2. The condition of the os uteri—virginal or gaping, lacerated, etc.
3. Vaginal secretions, and if present, their character.
4. The general appearance of the breasts, presence of milk, etc.

(*c*) Whether there be any signs of irritant poisoning in the stomach, or of inflammation of the bladder, kidneys, rectum, etc. The contents of the stomach, if necessary, should be preserved.

(*d*) Whether the viscera generally indicate loss of blood during life.

III. *Examination of the Product of Conception.*

(*a*) Nature of the supposed product of conception.

(*b*) Consider whether there is evidence of a diseased condition of the membranes, or of the placenta.

(*c*) If a fœtus be found, determine whether it was born alive; its probable age, and the cause of its death.

(*d*) Determine whether, if there be wounds or other injuries, they were inflicted during life or after death.

IV. *Examination of all Drugs, Instruments, etc.*

Premature delivery may be induced by the physician "when the same is necessary to preserve the life of the woman, or of the child with which she is pregnant," the indications (see page 1002) for the procedure being rare at any time, and especially so before the period at which the child is viable.

Premature labor or abortion should never be induced without mature consideration, nor without consultation with a second physician, nor without full consent, in writing, if possible, of the husband or guardian; these precautions enabling the operator to prove, in case of difficulty, that there was a necessity for the operation, the life of the mother being in danger, and the operation less to be feared than natural labor, and that he had acted in good faith.

RAPE.

"The carnal knowledge of a female by force and against her will."

Carnal knowledge signifies *any* penetration of the male within the female organ, and need be only vulval, inflicting no injury on the hymen or other soft parts, and unaccompanied by the emission of spermatic fluid.

No matter what the age of the female, or whether she be chaste or unchaste, married or single, provided the carnal knowledge be against her will, it constitutes, in law, a rape, and is regarded as a felony; carnal knowledge of a girl under fourteen, whether with or without her consent, is rape, as is also, in most penal codes, carnality with the insane, with idiots, and with drugged persons.

In respect to all charges of rape, differences in strength, age, and development, must be carefully considered. A strong young woman can usually, provided she retains her senses, resist a man of ordinary power, and prevent the intromission of the male organ, while a very young or weak female could not prevent the consummation of the crime. Again, under threats of violence or death, fright may so paralyze the muscles of even a strong woman as to prevent effectual resistance, or syncope may be caused by fright or pain. Forced assent does not lessen the crime, *moral* force being, in the eye of the law, as much violence as physical force.

While sexual intercourse between an adult male and a very young immature girl is undoubtedly possible, it is, as a rule, only vulval, the hymen not being injured; when complete penetration does take place, serious injuries and lacerations are usual—on account of the narrowness of the vaginal orifice, the acuteness of the pubic arch and the deeply placed hymen—and death not rarely has resulted.

The presence of an *intact hymen*, if the aperture be *undilatable* and *small*, and the membrane itself normally placed, may be considered an almost *absolute* proof of virginity, more especially if other signs, such as a narrow and rugose state of the vagina, entirety of the fourchette and perinæum, and

plump and elastic breasts, with but slightly developed nipples, are found; on the other hand, a dilatable or torn hymen cannot be considered proof of sexual connection, for its condition may be the result of accident, of congenital malformation, or of medical or surgical treatment. A freshly lacerated hymen may, however, constitute very important evidence in a trial for rape. Pregnancy may undoubtedly occur after rape, the same as after ordinary connection.

The examination in a case of supposed rape should be made as soon as possible after the commission of the crime, notes being taken upon all the points mentioned in the following schedule, which is taken from the admirable work of Tidy.

A. Examination of the Female.

I. Record—

(*a*) The date and hour when the female first made complaint, and the precise words employed by her at the time.

(*b*) The persons by whom she was accompanied.

(*c*) The general behavior of the female. Whether her statements were apparently made under compulsion or were in any measure dictated by those accompanying her.

(*d*) The general feeling of those accompanying the female, (1) toward herself, and (2) toward the accused.

(*e*) Any further remarks made by the female or her friends.

[If the medical jurist be directed to visit the female for purposes of examination, it is advisable that he should not give notice of the precise time of his intended visit, in order to avoid preparations being made for it.]

II. Enquire—

(*a*) The age of the female.

(*b*) The *date*, and *exact time*, when the rape was said to have been committed.

(*c*) The place where it occurred.

(*d*) Whether she uttered any cries, or was too terrified to do so.

(*e*) The exact circumstances under which the rape was committed; as, for example, whether the parties were standing or lying on the ground, etc.

(*f*) Whether or not the female was menstruating at the time.

(*g*) Whether she was sensible during the whole time that the offense was committed.

[Avoid all leading questions, especially in the case of children.]

III. Note—

(*a*) Whether the female exhibits any signs of narcotism, or of intoxication, or otherwise of drugging. This detail will be of no use unless the person be brought for examination immediately after the rape was committed.

(*b*) Whether the female walks as if in pain.

(*c*) Whether she appears of robust constitution, or whether there are signs of a low state of health, struma, etc.

(*d*) Whether she has the general appearance of a masturbate.

Having remarked on these points and made sufficient general inquiries, let the female be undressed. Institute a thorough investigation, with professional assistance, if possible.

IV. Examine the clothes worn at the time of the alleged rape. Preserve such portions as may be necessary for microscopic examination for—

(*a*) Blood.—Note if the stains are uniformly red, or marked by want of uniformity, suggestive of the admixture of blood with mucus.

(*b*) Semen.

(*c*) Other discharges.

(*d*) Mud, dirt, etc.

[Note if any of the clothes worn at the time of the alleged rape are torn, and, if so, the position of the rents. Record further if there are any indications of the clothes having been very recently washed.]

Note, with respect to *stains*—

1. That the presence of a blood stain does not prove connection against the consent of the female, nor that the injury, even supposing the blood to have come from the genitals, was the result of violence from intercourse. Such injury might arise from the introduction of a foreign body, or of the fingers, or be due to menstruation. The *absence* of blood, moreover, does not prove that the charge of forcible rape is untrue.

2. That the *presence* of a seminal stain on the garments of a female is strong presumptive evidence that a rape, or an attempt to rape, has been committed, although it in no respect fixes the crime on any one individual. The *absence* of seminal stains is no proof that the charge of rape is unfounded.

3. That with respect to stains arising from other discharges, it is practically impossible to differentiate the character of a discharge (*i. e.*, whether it be gonorrhœal, leucorrhœal, etc.), by the appearance of the stain.

4. That it is most important to compare mud stains that may be found on the clothes of the accuser with mud stains existing on the coat or trousers or other garments of the accused; and further to compare both with the earthy matter found at the precise spot where the assault was said to have been committed.

V. Whether the breasts are virginal, or show signs of having been manipulated, etc.

VI. Carefully examine and record all *general* injuries or marks of violence on the body of the female.

Note, with respect to such general injuries—

(*a*) Their character, size and exact position.

(*b*) Their probable age.

(*c*) How far they coincide with the story told by the victim.

(*d*) Whether the injuries could have been self-inflicted.

(*e*) Whether they could have been inflicted by others for a malicious purpose.

[Marks of general violence constitute most important evidence. It should be carefully considered whether the marks of injuries correspond or not with the alleged cause.]

VII. Carefully examine and record the appearance in detail presented by the genital organs.

1.—*External Genitals.*

Note—

(*a*) The presence of swelling, redness, tenderness, bruises, wounds, lacerations, etc.

(*b*) Whether the vulva, or the hairs on the vulva, show any appearance of being massed or clotted. If this be the case, the hairs are to be cut off and preserved for microscopical examination.

(*c*) Whether any dried blood stains on the genitals be visible.

(*d*) Whether there is any external sore on the genitals.

(*e*) The probable date of the several injuries observed.

2.—*Internal Genitals.*

Note—

(*a*) Is the perinæum or fourchette lacerated?

(*b*) Is the hymen ruptured or inflamed?

(*c*) Are the carunculæ apparent, and if so, what is their condition? (i. e. are they small and colorless, or large and inflamed?)

(*d*) Is the vagina narrow and rugose?

(*e*) Is there any sign of disease, such as noma, etc.?

(*f*) Are there any syphilitic sores?

(*g*) What is the probable date when the injuries noted on the female were inflicted?

If the existence of syphilis or gonorrhœa be indicated, inquire—

(*a*) All particulars as to time, date, etc.

(*b*) Whether the female has been exposed to the possibility of infection otherwise than by intercourse?

[If there be extreme tenderness and swelling, make as full an examination as possible at the time, postponing a more complete examination until the swelling has subsided.]

Supposing marks of violence are found on the genitals—

1. Consider whether such marks may result from masturbation, or be self-inflicted, or result from the introduction of foreign bodies, etc., or be inflicted by others for a malicious purpose.
2. That, given signs of non-virginity, intercourse is not necessarily established because marks of violence be present.
3. That, given marks of injury caused by intercourse, such intercourse may have been by consent.
4. As a rule, therefore, the medical jurist should content himself with merely stating the marks observed by him, without stating their cause.

Supposing no marks of violence are found on the genitals—

1 Consider whether the interval since the crime was said to have been committed is sufficient to explain the disappearance of such marks.

2. If the examination be conducted immediately after the crime was said to have been committed, and the victim be of tender years, the absence of all marks of genital injury is strong presumptive evidence that a rape has not been committed.

3. On the other hand, if the victim be accustomed to sexual intercourse, the absence of marks of injury on the genitals is no certain proof that a rape has not been committed.

VIII. Examine carefully any discharge from which the female is suffering, remarking its character (*i. e.*, whether it be thick or purulent), its quantity, its probable source, etc.

Enquire—

(*a*) Whether the female suffered from any discharge previously to the alleged rape having been committed, and

(*b*) If not, how soon afterwards did the discharge occur?

[Supposing a discharge to be present, the question will be all important whether the accused is suffering from gonorrhœa.] The medical jurist should not commit himself as to the exact nature of the discharge.

Post-mortem where death has occurred from rape.

1. Examine the body generally for injuries, bruises, fractures, etc.
2. Examine the mouth for foreign bodies.
3. Examine the genital organs.

With respect to injuries consider—

(*a*) Are they such as to indicate that a rape has been committed?

(*b*) Are they sufficient to have caused death?

(*c*) Might the injuries have been caused by malicious design after death?

4. Examine the vaginal secretions, the pubic hairs, the vulva, etc., for spermatozoa.

5. Are there any post-mortem appearances by which the death might be accounted for other than those resulting from rape?

B.—Examination of the Accused.

Note—

(*a*) His size, strength, and general development, in comparison with those of the accuser. Is he impotent or not?

(*b*) Marks of scratches, etc., on the face, hands, penis, and body generally.

(*c*) The condition of the frænum, the presence of seminal fluid in the urethra, and of the smegma around the glans, etc.

(*d*) Rents in, or stains of blood, semen, mud, etc., on the clothes.

(*e*) Whether the marks on the accused correspond or not with those on the accuser.

(*f*) Whether the stains of mud or dirt, etc., on the clothes or boots of the

accused, correspond or not with what might have resulted from a struggle at the spot indicated by the accuser, or that where the alleged crime was committed.

(*g*) Whether the accused be suffering from gonorrhœa or syphilis. If he is not, and the accuser is, or if he is and his accuser is not, such evidence is most important.

C.—Examination of the Spot where the crime was said to have been perpetrated.

Note—

(*a*) Whether the ground shows any marks indicative of a struggle.

(*b*) Whether any articles of dress, jewelry, etc., can be found on the spot where the rape was alleged to have been committed, such as might lead to identification, or otherwise be important as evidence.

(*c*) Whether the character of the mud, or of other materials likely to cause marks upon the clothes—such as paint, tar, etc.—correspond with the marks actually found on the garments of the accuser or of the accused.

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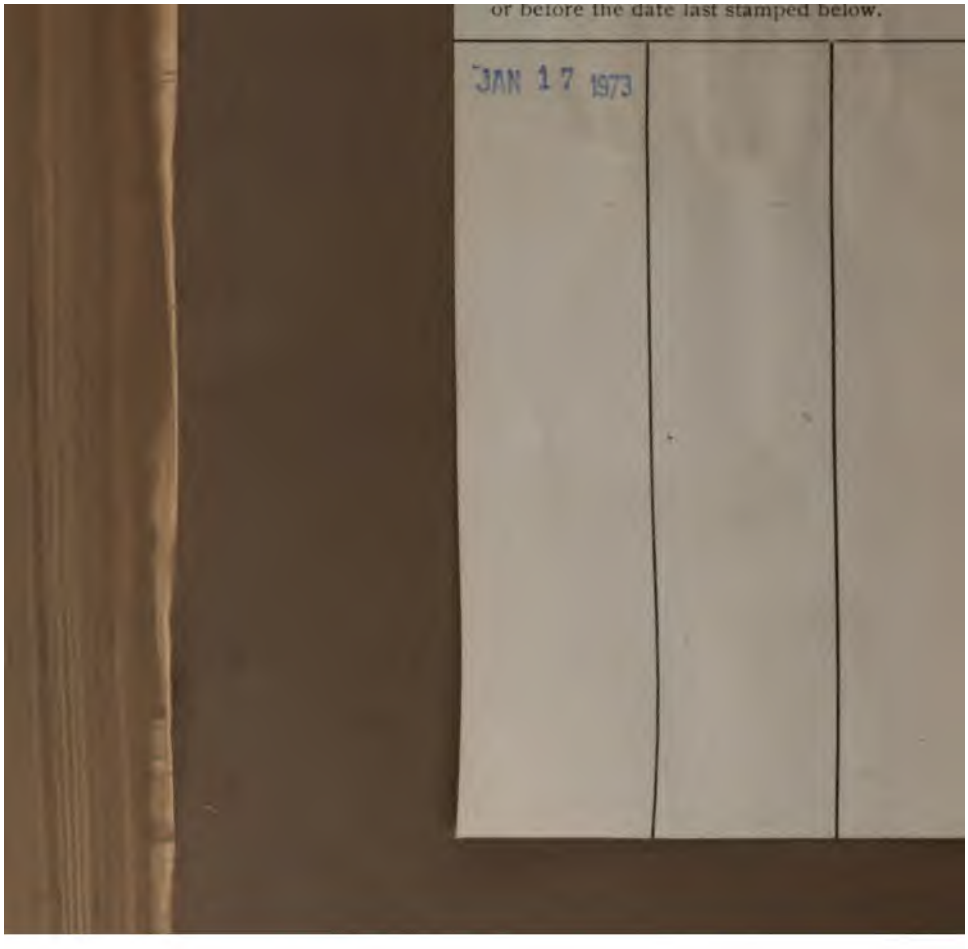
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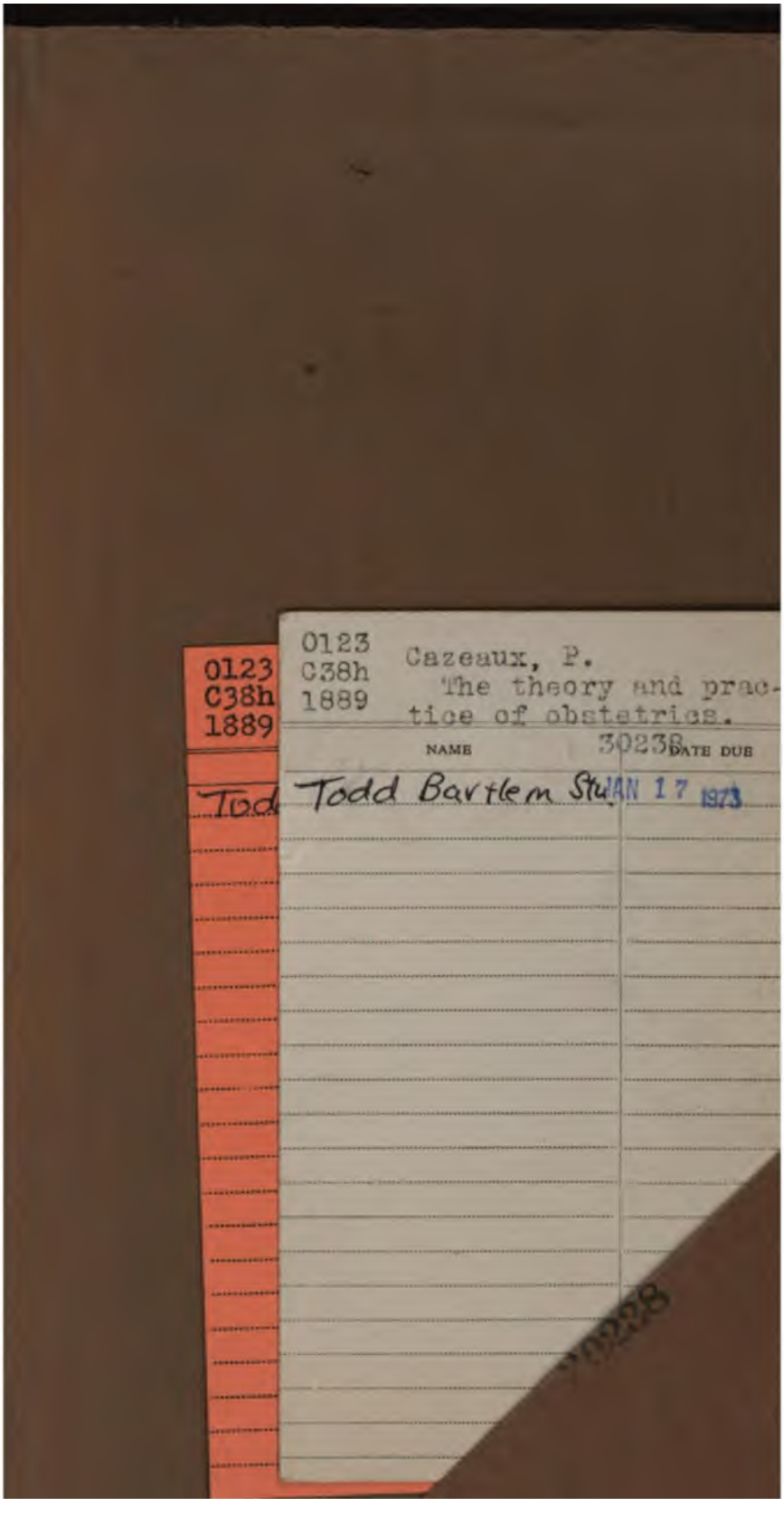
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